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PROPOSAL

FOR THE

EAGLE CRAG (AGUA TIBIA)

RESEARCH NATURAL AREA

Prepared by

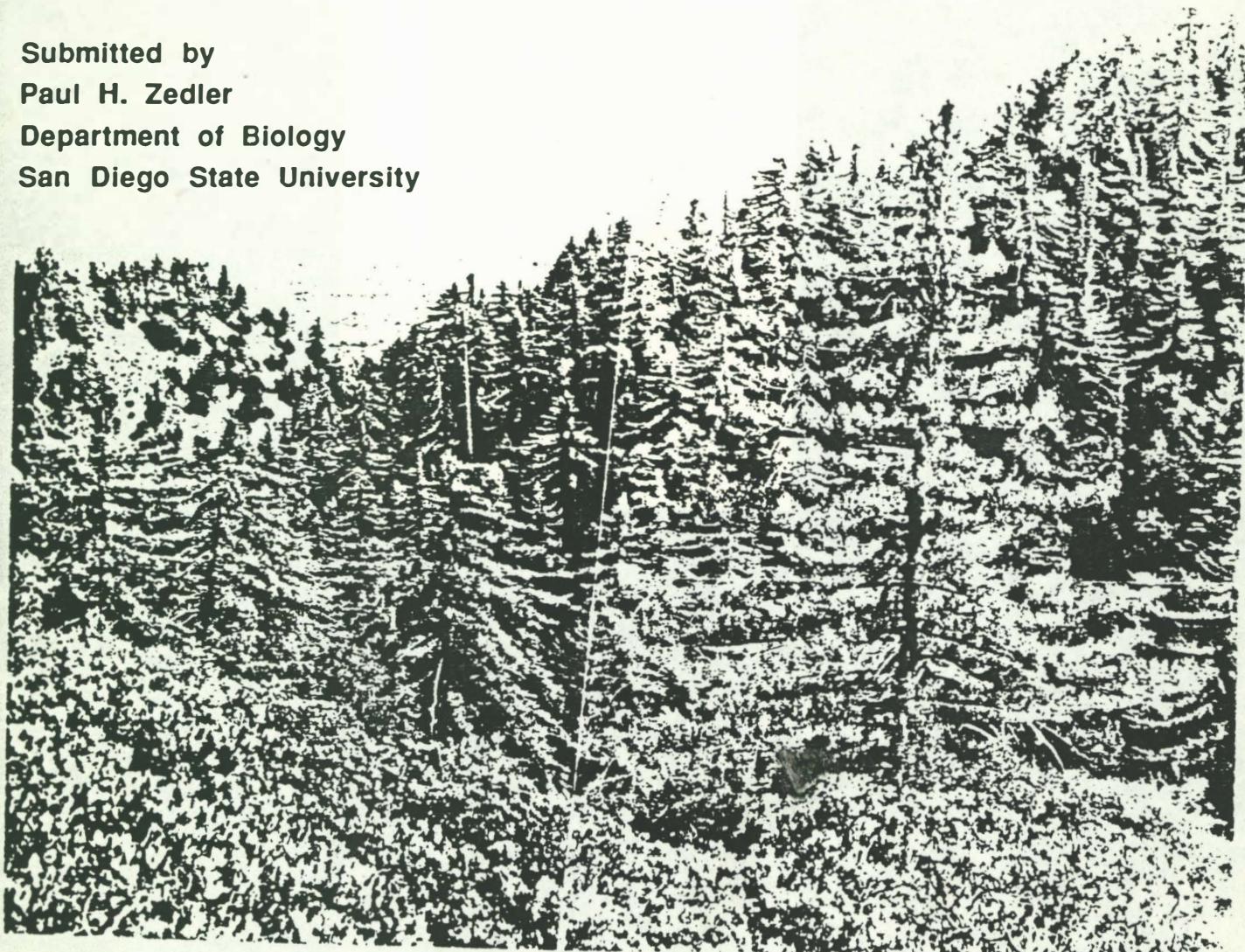
Chris Frazier

Submitted by

Paul H. Zedler

Department of Biology

San Diego State University



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National Forest
USDA Forest Service

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INTRODUCTION

Location

(Agua Tibia)

The proposed Eagle Crag Research Natural Area (ECRNA) is located in the far north of San Diego County, California in the Agua Tibia Mountains. It is approximately 80 Km (50 miles) north of San Diego and 120 Km (75) miles south of Los Angeles (Appendix I, Figure 1 and Figure 2 inset). Formally, it is found in sections 13, 14 and 15 of Township 9 south, Range 1 west (Appendix 1, Figure 3). The ECRNA falls wholly within the the 6500 ha (16,000 acre) Agua Tibia Wilderness. The Wilderness, in turn, is a part of the Palomar District of the Cleveland National Forest.

The southern border of the ECRNA adjoins the Wilderness boundary. The neighboring lands belong to the Pala Indian Reservation. All other adjoining areas are Wilderness.

Access

One of the desirable features of the ECRNA is its remoteness from human contact and its general lack of human disturbance. This, however, is at the cost of difficult access. While several options theoretically exist for accessing the area some may be problematic or impractical for a given need.

The most dependable public access is via the maintained Forest Service foot trail from Dripping Springs Campground (Appendix I, Figure 2). This 19 Km (12 mile) trail has a vertical gain of 875 m. (2,870 ft.) and is the shortest all-public access from a major road. A similar trail leads from Aguanga to the RNA and is approximately 14 Km (9 miles) long.

A 11.25 Km (7 mile) dirt road allows motorized access from the Palomar Mountain Fire Station to the ECRNA's southern border; however, it crosses both a private inholding

and the Pala Indian Reservation. Access to or across the inholding is presently limited to certain Forest Service staff only. Blockage due to fallen trees or washout is also likely.

Crosley Road/ Cutca Road is accessible from state highway 79 and leads(13.25 Km, 8.2 miles) to a trail head 4 Km (2.5 miles) from the RNA's east side. This road also crosses private land; however, it is well maintained and access is currently permitted with a Forest Service escort. This is the access used for most of the field surveys for this study.

Trails

The Eagle Crag RNA has only two established trails, both of which are maintained by the Forest Service. Magee Palomar Trail (2w01.3) runs from the north ECRNA border along the divide and continues near the 1400 m (4600 foot) contour on the northeast side of the divide all the way to (and past) the wilderness boundary. It was once a fire road (Palomar Divide Road) and, though still wide, it is used (and useable) now only for hiking.

At a well marked junction within the ECRNA, 2w01.3 turns into Palomar Divide Road and the narrower foot trail, Cutca Trail (1E01) {which on most older maps is called Magee Palomar Trail}, continues northeast down through the chaparral. It reaches the ECRNA boundary at about 1250 m (4100 feet) and continues downstream to Cutca Valley.

One other path, an unmapped and somewhat obscure trail, leads from the intersection of Magee Palomar Trail and the northern ECRNA boundary to the Eagle Crag itself.

The area to the west of the divide, almost half the area of the ECRNA, is without trail service. Because of this and because of the extremely dense brush and steep slope, this part of the RNA must be considered remote and untraversable. As such, at least one important feature of the ECRNA, the madrone groves, are unapproachable from public access.

Distinctive Features

The Eagle Crag area possesses two principle features which make it especially interesting for research and conservation. The first and most obvious feature is the presence of the geographically limited *Pseudotsuga macrocarpa* (Vasey) Mayr (bigcone Douglas-fir or BCDF). This species is a relict (McDonald and Littrell, 1976) endemic to Southern California (Griffin and Critchfield, 1976 and see Minnich, 1982). Dense stands of it are found on the steep slopes of the ECRNA, usually in association with *Quercus* ^h*crysolepis* Liebm. (Canyon Live Oak). The ECRNA stand comprises a fairly distinct and pure patch of what has been described as a BCDF-Canyon Oak forest (McDonald and Littrell, 1976).

The ECRNA stand is interesting for its great age, size and purity of the stand, placement near the southern extent of BCDF's range and also for its remoteness and lack of disturbance by man. The suggested boundaries of the ECRNA were drawn to incorporate the majority of this stand along with several different adjoining areas composed of different vegetation types.

The second feature of interest of this area is the unusual occurrence of some species of plants found here. One plant found in a small portion of Magee Palomar Trail, *Linanthus orcutti*, is listed by the California Native Plant Society as rare throughout its range. Also important is the presence of several species at or near the southernmost extent of their range. The BCDF is one example. *Lonicera hispidula* (California Honeysuckle), *Bromus orcuttianus* var. *hallii* (Hall's Brome), *Chimaphila menzeisii* (Little Prince's Pine) are also found fairly commonly in the ECRNA yet are much less common to the south. Two species, *Pterospora andromedea* (Pine Drops) and *Sedum spathulifolium* (Yosemite Stonecrop) have not been reported elsewhere in San Diego County and are, thus, the southernmost populations of the species.

Also notable, is the inclusion within the RNA of a stand of *Arbutus menziesii* (Madrone). This tree species is common in the far Northwest, but quite rare in Southern

California (Griffin and Critchfield, 1976 and see Minnich, 1987). Here, madrone is found in scattered relictual groves (Axlerod 1967). As with the Bigcone Douglas-fir, Madrone seems to be limited to more mesic sites. The largest single stand of BCDF in the Santa Ana Mountains also supports a few madrone trees (Bolton and Vogl 1969) and so, perhaps, it is not surprising that both species are found here as well.

The ECRNA grove represents madrones near the extreme Southern limit for the species. Only the grove on Rodriguez Mountain, less than 16 Km (10 miles) to the south, is known to be more southern than that of the ECRNA.

PHYSICAL SETTING

General

The ECRNA lies in the southern portion of the NW-SE transversing Agua Tibia mountains. These mountains form the NW head of the Palomar Mountain Range which continues easterly and then tails into the Aguanga mountains, another NW-SE range.

^{modified} ^{proposed by the author}
The proposed ECRNA incorporates 191 hectares (471 acres) between an elevation of 900-1550 m. (3000-5077 ft.). The highest point of the Agua Tibia mountains, a rock outcropping known as Eagle Crag, is included within the proposed bounds of the ECRNA.

The Agua Tibia range divide passes through this crag and separates the RNA into two general faces. One is mostly west-facing with less eroded slopes and the other, a more northerly facing slope, is cut by several minor drainages and is where most of the BCDF are found. The upper region of the ECRNA surrounding the crag itself is a more gently sloping saddle with an average grade of about 30%. Areas below this generally slope at 60-70%.

Climate

The general climate of coastal Southern California is characterized by a moderate temperature overall with rain falling predominantly in the winter. In the mountains, summer thunderstorms may occur. Average yearly rainfall estimates obscure a tendency for large variation in the annual rainfall between years. Currently (1989), we are in the third year of a moderate to severe drought.

The climate of the ECRNA, at least the upper elevations, may be reasonably approximated by the climate at the Palomar Observatory, 11.5 km (7 miles) away (elevation 1689 m, 5541 ft.). Average monthly temperatures peak in the low 70s in July and August and hold in the low 40s from January through March (Close, et al., 1970).

Substantial rain is unlikely from June until September, but an average precipitation of 58 cm (23 inches) falls over the course of a year. Palomar reports that 104 cm (41 inches) of snow falls per year, though this may be expected to drop off substantially with decreased altitude. A more likely estimate for the ECRNA would be about 51 cm (20 inches) of snow or less at the saddle and less than $10^{\frac{cm}{\wedge}}$ at the lower elevations.

Geology

The geology of interior San Diego County is dominated by the Peninsular Ranges batholith, a large body of intrusive igneous rock that is exposed from Riverside County to the tip of Baja California (Weber, 1963). Granodiorite and quartz diorite, the most prevalent components of the batholith, form the majority if not all of the foundation of the ECRNA. The rock outcroppings found here are whitish to somewhat orange with black flecks and are representative of this rock type. No $gabroic^b$ plutons or other interesting geological formations were detected.

The Agua Tibia Management Plan (Schmechel, et al., 1977) reports that there is no evidence of any economic mineral deposits in the Wilderness. Since 1983 the wilderness (and by association the ECRNA) have been closed to new mineral claims. None were known to have been filed previously.

Soils

The U.S.D.A. soil survey of San Diego County (1973) reports the presence of two soil series within the boundaries of the ECRNA; both of which were formed in place from weathered granodiorite (Appendix II). On the west side of the divide (Eagle Crag), the predominant soil type is of the Tollhouse series and is described as a rocky, coarse, sandy loam. It is fairly shallow (5 -20 inches deep over hard rock), slightly eroded and covered to as much as 25% by large boulders and 10% by rock outcroppings.

The soils of the east side of the divide are characterized as part of the Crouch series. The soil is more acid and deeper (36 to 58 inches) than that of the Tollhouse series. The rock outcroppings make up the same percentage of the surface as they do in the Tollhouse,

though stones and cobbles are found in place of large boulders. The slope is steeper, to as high as 70%.

Both soil types have rapid to very rapid runoff and the erosion hazard is high to very high.

The ground surveys for this report corroborate these profiles with little discrepancy. No gabbroic or other interesting soil types were observed.

Erosion is a considerable feature of the RNA's physical profile, especially on the north-east facing side where the bigcone Douglas-fir are found. Nowhere is erosion more evident than on Magee Palomar Trail, the major foot trail through the RNA. Slides above the road have left tailings almost blocking the wide trail in places. In others, slides have swept large chunks of the trail into the basin below.

Water Resources

While there are many drainages within and bordering the RNA none holds water year round. By mid-August at most only a few small pools of standing water remain.

PAST USES AND IMPACTS

Archeology

Local Native American populations are currently found on many of the areas surrounding the Agua Tibia Wilderness. It is likely that, in the past, they used the RNA area for manzanita gathering, hunting or religious purposes.

Nevertheless, little is known about the early history of the area (Schmechel, 1977). The Agua Tibia Management Plan assumes that historic use of the Wilderness was limited by the dense chaparral and steep slopes.

No archaeological signs are knownⁿ within the RNA and none was observed in the course of this study.

Fire History

Available records and evidence suggests that the ECRNA and the surrounding Wilderness have not burned in over 100 years (Schmechel, 1977). The chaparral of the Agua Tibia Mountains is, in fact, noted for its age and unusually high development due to the exceptionally long fire interval. As would be expected, the fuel load of the wilderness is high and the risk of catastrophic wildfire correspondingly large.

In the fall of 1987 a dramatic man-caused fire swept through much of the Palomar mountains and approached the ECRNA from the oak and conifer forests to the south. An unusually heavy rain storm providentially quenched the fire as it neared within kilometers of the ECRNA. In the major watershed of section 23, in fact, the fire reached its closest point, apparently eliminating the shrub understory all the way to the creek bottom only half a kilometer from the wilderness boundary. Much of the oak and conifer forests on the adjacent Pala Indian lands was destroyed by this fire.

Visitor Use

The ECRNA lies astride a 25 mile hiking trail from Dripping Springs to Aguanga. Visitor use is low due to the length and difficulty of the hike and to the lack of campsites and reliable water sources.

Impact due to visitor use is minimal at present. The dense vegetation and steep topography effectively limit access to the trail corridor. The major impact by visitors on the area is to raise the potential occurrence of a man-induced fire.

Logging

It is not believed that the area has been logged.

Drought and Bark Beetle Damage

At the beginning of this survey, in May of 1988, there was one patch of dead Coulter pines ^(*Pinus coulteri*) on a slope to the north of the ECRNA, but no signs of bark beetle damage within the ECRNA. At the beginning of June, 1989, most of the Coulter pines on at least one slope adjacent to the ECRNA were dead and a large portion of the Coulter pines in the ECRNA were beginning to turn brown or were already dead. It seems likely that the stress of several years of less than average precipitation has made the Coulter pines exceptionally vulnerable to attack by bark beetles and that a continuation of the current situation will lead to a dramatic reduction in the number of Coulter pines found in the ECRNA.

In spite of the effect of bark beetles on the Coulter pine population, the BCDF seem to be healthy and free from attack.

BIOLOGY

Major Vegetation Types-Introduction

In order to come up with a standardized account of vegetation types Holland (1986) describes numerous common Californian plant associations in a numerically designated outline format. Using this scheme the major vegetation types of the ECRNA fall within three categories: (84150) Bigcone spruce-Canyon Oak Forest, (37520) Montane Manzanita Chaparral and (81320) Canyon Live Oak Forest.

While these terms give a general impression of the area, other categories might have been used for more scattered or less distinct elements (such as Ceanothus leucodermis Chaparral or Southern Riparian Forest). Also, as one might expect, many of the species listed in Holland's general descriptions are not found in this area, while others not listed are common. It is, therefore, important to consider the actual patch type description and species composition of the RNA in order to profile it accurately.

The major vegetation types are shown in appendix III, figure 1. Their absolute and relative areas are summarized in appendix III, table 1. A complete list of vascular plant species encountered in the ECRNA is found in appendix IV.

Bigcone Douglas-fir-Canyon Live Oak Patches

In general, the eastern portion of the ECRNA is dominated by two patches of bigcone Douglas-fir and canyon live oak which cover a combined area of 89 hectares or 47% of the RNA's total area. The larger patch (64 ha) is a steep sloped bowl with north to northeast exposure. The smaller area is a 25 ha northwest facing slope separated from the former patch by an expanse of chaparral.

The best development of the Douglas-fir is found on north-facing slopes. Towards the upper elevations of this vegetation type higher proportions of Coulter pine and canyon

live oak are found. The proportion of canyon live oak also increases on the more southern exposures.

There is essentially no understory shrub cover beneath the BCDF; however, in occasional open areas small patches of *Arctostaphylos glandulosa* and sometimes *Ceanothus leucodermis* are encountered.

Herb cover is also diminished due to the canopy shading by the tree species. The most common herb species are: *Chimaphila menziesii*, *Erigeron foliosus*, *Hedera* *albiflora*, *Linanthus floribundus*, *Monardella macrantha macrantha*, *Osmorhiza chilensis*, *Silene lemmonii*, *Sedum spathulifolium*, *Toxicodendron diversilobum*, *Carex* sp. and the Ferns *Polystichum munitum* and *Dryopteris arguta*. These taxa easily make up over 95% of the species encountered.

Bigcone Douglas-fir Stand Characteristics

To characterize the BCDF stand further three 2 x 50 m belt transects were laid out at different positions perpendicular to the slope. Three altitudes were chosen to sample; at 1280, 1340, 1400 m (4200, 4400 and 4600 feet). The slopes at the transects ranged from 64 to 72 % and all were within 15 degrees of true north.

Trees were placed into size categories following the methods of McDonald and Littrell (1976). "Seedlings" included plants below 30.5 cm. tall; "saplings" were those from 30.7 cm ^{height and up to} 2.5 cm diameter at breast height. Trees larger than 2.5 cm. diameter at breast height were placed into 5 different categories according to diameter at breast height. The results are summarized in appendix 3, table 2.

Quercus chrysolepis had 20 times more seedlings present than had *Pseudotsuga macrocarpa*. There were, however, equal numbers of ^{mature} trees per hectare for the two species. The BCDF trees tended to be much bigger than the oaks and had 8 times more basal area per ha.

Results for the size class distribution and densities for the two species correspond well to what was found in the study by McDonald and Littrell (1976) for regenerating bigcone Douglas-fir-canyon live oak forests. This conclusion was further supported by the results from a limited number of tree core samples (Appendix III, ~~table 4~~). These suggest that the tree size class distribution correlates to a wide distribution of tree ring counts and, hence, tree ages. Tree ring counts indicated a distribution of ages from 37 years (for a sapling with a DBH of 5.2 cm) to over 250 years in trees with a DBH greater than 50 cm. It is unfortunate that the increment borer used could not penetrate greater than 25 cm in depth since several trees were encountered with radii in the 50-75 cm range (DBH 100-150 cm). Extrapolation suggests that such trees may be as old as 500-600 years. ~~¶ Data~~ were taken on herb cover during September 1988. Because of the high percentage of annuals in the understory flora which are mostly seasonal in cover this sampling is not believed to be indicative of either the full complement of species nor does it represent a meaningful percent cover. The common species of the understory were listed previously. The herbaceous cover was found to be less than 7 percent and over the course of a year never seemed to become greater than 10-15 percent.

Montane Manzanita Chaparral

On the southwest-facing slope through which the Magee Palomar Trail passes the bigcone Douglas-fir gives way to a vegetation composed mostly of *Arctostaphylos glandulosa*, *Arctostaphylos pringlei drupacea*, *Ceanothus leucodermis*, *Quercus chrysolepis*, *Quercus wislizenii* and *Adenostoma fasciculatum*. This patch extends upslope to 1540 m (5000 feet) where it then continues along the windswept crest of the Agua Tibia divide. Coulter pines line the border between this patch and the bigcone Douglas-fir patch and are found scattered within the chaparral; though, as mentioned before, their numbers are diminishing as the bark beetle infestation takes its toll.

Chaparral Patch Characteristics

A transect was taken along Cutca Trail from the point at which it diverged from the old fire road to the point at which it entered the forest near the border of the ECRNA. Every eight meters the species of the shrub directly south of the trail was recorded. Presence data was taken for the shrub to the right of the trail approximately every eight meters (10 paces). The results are presented in appendix 3, table 3.

By far the most common species in this patch is *Arctostaphylos glandulosa* which was found to make up almost 60 % of the vegetation. Chamise, *Adenostoma fasciculatum*, was the second most encountered shrub at only 10% relative frequency.

While the other reported shrub percent frequency values are low, these species are somewhat patchy in distribution and take up greater importance in some smaller localities within the mapped range of the ECRNA chaparral. Coulter pine, for example, dominates the chaparral directly above Palomar Divide Road; though, as mentioned before, at the last survey date these trees were all dying. *Ceanothus leucodermis* is somewhat clumped in small areas scattered throughout the chaparral. Canyon live oak, while truly scattered throughout the chaparral is found in higher numbers near the edges.

Canyon Live Oak Forest

The western half of the ECRNA is a broad slope dropping over 600 m. (2000 feet). No bigcone Douglas-fir is found in this region, but canyon live oak is plentiful. The oak is found in monospecific stands, interspersed with patches of *Ceanothus leucodermis* (with or without *Prunus illicifolia* or chamise) or patches of *Arctostaphylos pringlei drupacea*. These patch types loosely segregate with respect to northerly (oak) and southerly (manzanita or ceanothus) exposure. Patch sizes vary from just a few tens of meters to tens of hectares. In all cases, the vegetation of this slope is extremely dense with complete canopy closure. As such, this area is effectively impenetrable.

Other Vegetation Types of Special Interest

Riparian Vegetation

Several major drainages are found within the ECRNA which have a vegetation type significantly different from that of their adjoining slopes. Dominant herbaceous species include *Rubus ursinus*, *Ribes nevadense*, *Ribes amarum*, *Toxicodendron diversilobum*, *Rhododendron occidentale*, *Urtica holoserica* and *Zauschneria californica*. More mesic tree species found here include *Calocedrus decurrens*, *Acer negundo*, *Quercus agrifolia*, *Populus trichocarpa* and *Platanus racemosa*. The cover of this riparian vegetation varies greatly between drainages and at different positions within a given drainage. Some areas are quite open while others are impenetrable thickets. The riparian area at the base of the westerly slope in section 15 could not even be approached except for at the lower elevations due to the dense vegetation.

Madrone/ Canyon Live Oak Area

A small population of Madrone trees is found at the base of the Canyon Live Oak Forest slope in the most western part of the ECRNA. As mentioned before, madrone warrants special attention because they are extremely uncommon this far south. Meyer (1931) reports as a southern range extension "near the Palomar mountains." They are known to occur in Castro Canyon, an Agua Tibia Mts drainage to the north of the ECRNA.

In the ECRNA, they occur in level terrain mostly along the Agua Tibia Creek drainage at the lowest point within the ECRNA. At 850 m (2800 feet) it is almost 370 m (1200 feet) lower than the top of the slope at the point where Magee Palomar Trail enters the ECRNA from the Northeast.

Canyon live oak is the dominant species and these are larger here than on the slope above, perhaps to as tall as 18 m (60 feet). The madrone are equally as tall. *Quercus*

agrifolia (Coast Live Oak) and *Platanus racemosa* are other tree species commonly found here.

Overall, the understory is open and passable. *Ceanothus oliganthus* and *Styrax officianalis* are common shrub species. Other common vegetation includes *Toxicodendron*, *Ribes*, *Rubus*, *Lilium occellatum* and *Keckiella cordifolia*.

The madrones are scattered in clumps of individuals, each of which has several stems coming off of the same root crown. Seedlings, saplings and mature trees were all observed indicating that normal regeneration of the stands is occurring. Though no core samples were taken to age these trees the largest diameter at breast height for a stem was measured at 65 cm.

I estimate that only about 100 stems of Madrone are found within the ECRNA. Most (over half) are concentrated within a hectare sized area between 850 m and 923 m. elevation (2800-3000 feet) very near where the western slope drainage joins the drainage from section 23. Several more are scattered at points along the southern side of the creek slightly further upstream. Finally, at least 15 more stems are found scattered among the live oak further upslope, but below 985 m. (3200 feet). The areas where these are located are shown on appendix III, figure 1.

It might be noted that the madrone are more common just south on the Pala Indian land. Here they intermittently line the south side of the drainage from section 23 to as high as 1170 m. (3800 feet).

Magee Palomar Road Corridor

This corridor merits special consideration since, though artificially maintained, it is the only open, flat area in a region of high canopy closure. The dominantly herbaceous cover of the trail is similar to what might be expected in a post-fire environment or within clearings in the chaparral. Common species include *Lotus* sp., *Erigeron foliosus*, *Linanthus floribundus*, *Phacelia* sp., *Castilleja* sp., *Lupinus* sp., and *Sedum spathulifolium*.

Most of the species are found or are expected to be found elsewhere within the ECRNA, either in the BCDF understory or in limited cleared areas; however, one species of particular interest, the rare Polemonaceae *Linanthus orcuttii pauciflora*, was found within the ECRNA only along the trail.

Notes On the Plant Collection

The flora of the Agua Tibia Mountains is some of the least studied in San Diego County and even after this survey, it will remain so. While much of the area of the proposed ECRNA was covered in the course of this survey, this work represents only a beginning. Many areas were visited only briefly and most during only a narrow section of the growing year. Many areas still remain remote and unstudied.

The flora of the ECRNA represents a mixture of interesting and diverse elements; from the north and the south; from chaparral to oak and conifer forest. It should be expected that further endeavors will yield new discoveries and interesting surprises for those who study here. I do not doubt that other range extensions may be found and that other endangered or rare species are possible in the ECRNA which were overlooked in these surveys.

Rare Plants, Range Extensions and Species of Interest

Linanthus (Parry & Gray) Jeps. *orcuttii* Polemonaceae

Orcutt's Linanthus is on the CNPS 1b list and judged to be rare throughout its range. Its occurrence is limited to a few highly restricted populations, or present in such small numbers that it is seldom reported. It is found from Los Angeles County to Baja California and is not thought to be currently endangered.

Within the ECRNA Orcutt's Linanthus was found in the middle of Magee Palomar Trail near the saddle which marks the ECRNA's northern boundary. The area of cover is

quite small, just a few square meters. In May of 1988 it was found just in the saddle, while in June of 1989 it was found only in a patch about 30 meters south of the saddle.

Lonicera hispidula (Lindl.) Dougl. ex. T&G var.*vacillans* Gray

Caprifoliaceae

California Honeysuckle ranges as far north as southern Oregon and is not listed by the CNPS as rare or threatened. In San Diego county, however, it has only been reported on Hot Springs Mountain to the east of the Agua Tibias. The ECRNA populations are, therefore, near the southernmost range for the species. It is considered rare in the county by Beauchamp (1986).

Lonicera hispidula was encountered rarely alongside the canyon bottoms of the drainages on the north-facing bowl between 1100 and 1160 m (3600-3800 feet).

Pterospora andromedea Nutt.

Ericaceae or Pyrolaceae

Pinedrops is an herbaceous root-parasite found in dry, shady parts of montane coniferous forests; usually between 1520-1740 m (5000-9000 feet). Its range is extensive, from California to British Columbia and Mexico and as far east as the Atlantic Coast. Nevertheless, it has never before been reported in San Diego County. This locality, therefore, represents the most southwest reporting for the species.

Pinedrops were found only once, existing near the trunk of a bigcone Douglas-fir on the north-facing bowl at 1300 m. (4260 feet). This altitude is low for the species.

Sedum spathulifolium Hook. ssp. *yosemitense* (Britt.) Clausen Crassulaceae

Yosemite Stonecrop is not considered endangered or rare, however, it is not known elsewhere in San Diego County besides the Agua Tibia Mountains. Presence in the ECRNA constitutes a southern range extension.

Yosemite Stonecrop was found to be common on open, steep slopes within the bigcone Douglas-fir forest and common along Magee Palomar Trail in the part that was formerly the fire road.

Arbutus menzeisii Pursh. Ericaceae

Pacific madrone is a tall, reddish-barked tree which resprouts vigorously after fire. Though not rare, the madrones in the ECRNA are within 16 Km (10 miles) of the ^{known} ~~absolute~~ southern limit for the species distribution.

Information about the distribution and habitat of the madrones in the ECRNA is contained in the section "Madrone / Canyon Live Oak Area." A map of the distribution of *Arbutus menziesii* in California is contained in appendix 5, figure 1.

Pseudotsuga macrocarpa (Vasey) Mayr Pinaceae

Bigcone Douglas-fir is endemic to Southern California and is commonly associated with chaparral, Coulter Pine and Canyon Live Oak (Bolton and Vogl 1969, Mason 1940, McDonald and Littrell 1976). At lower elevations populations are extremely disjunct and surrounded by chaparral. Above 1300 m. stands are more widespread, sometimes covering entire slopes (Minnich 1977).

BCDF shows several adaptations to fire. First, increased seedling densities after fire suggest that seed germination may be stimulated by the fire or post-fire environment (Bolton and Vogl 1969). Secondly, the mature trees have the ability to withstand fire in two ways. Thick bark confers the ability of older BCDF to withstand fires. Also, if that doesn't work and the tree should still burn it has the remarkable ability to resprout and in this way reestablish itself in the new community structure (Gause 1966, Bolton and Vogl 1969).

BCDF may also be protected from fire by the nature of the community structure. Minnich (1977) reports that bigcone Douglas-fir forests had a greater chance of surviving

^{firs}
forest than Coulter Pine forest because the associated canyon live oak acts as a buffer against the spread of fire from adjacent chaparral. In this way, the BCDF forest is "conditioned" to have a longer fire frequency proportional to the lesser chance of a crowning fire. This accords with the longer period of maturation for BCDF.

Fossil evidence for bigcone Douglas-fir dates to the Pliocene, 7 million years ago (Mason 1940). Currently, it is found from the Mount Pinos region of Kern County to Chariot Canyon, south of Banner, San Diego County (Griffin and Critchfield 1972, appendix 5, figure 2). Though limited in range, its distribution seems stable. Two investigative teams have concluded that barring rapid environmental change BCDF "will continue to occupy the same relative position to other vegetation types in the future" (Bolton and Vogl 1969, McDonald and Littrell 1976).

The ECRNA stand lies close to the southern limit for the species (McDonald and Littrell 1976, Griffin and Critchfield 1972, Minnich 1982 and 1987). Details about its species composition and stand characteristics are contained in the sections "Bigcone Douglas-fir-Canyon Live oak Patches" and "Bigcone Douglas-fir Stand Characteristics."

Birds Likely

A list of birds seen or heard in the ECRNA is presented in appendix VI. Most of the sightings were made during a survey by Nils Warnock and this author on June 20, 1989. A few others were added as they were sighted at other times.

The interesting habitats and location of the ECRNA suggest that unusual occurrences and uses by bird species are likely in the area. One species which was not sighted deserves special mention. The spotted owl, *Strix occidentalis*, has lately garnered much attention as its numbers decline due to habitat destruction. Though not sighted, it is thought the the ECRNA might be excellent habitat for spotted owls due to the stand age, uneven age distribution and proximity of oak forests.

Vertebrates Likely

A list of reptiles and amphibians which might occur in the ECRNA and which are known from Palomar Mountain area is presented in appendix VII. A list of mammals which are likely to be present is given in appendix VIII.

RECOMMENDATIONS

Values To Be Preserved

The region around Eagle Crag is an area of remote beauty. For the general public it is one of the more inaccessible areas of the county, usually requiring more than one day of hiking to approach and leave. The vegetation is generally free from exotics. The pigeons in the trees are native. And, as it stands now, much of the area remains little visited or disturbed. On a clear day one can look out from Eagle Crag over the surrounding Agua Tibia Wilderness, the undeveloped Pala Indian Reservation, the Cleveland National Forest on Palomar Mountain and from there take in a vista which includes the San Jacinto mountains to the north and the Pacific Ocean to the west.

This area has special features which merit the designation as a Research Natural Area. Its target species, *Pseudotsuga macrocarpa*, is represented with the inclusion of one of the more impressive stands of bigcone Douglas-fir-canyon live oak forest in existence. Some of the BCDF are likely to be as old as 600 years and the mean age may be over 100 to 150 years. The trees cover the steep north-facing slopes in a total area of almost 90 hectares.

Sizeable patches of vegetation types associated with BCDF forests are also found within the proposed boundaries of the RNA. Manzanita chaparral, canyon live oak forest and riparian forest are all well represented.

Further, the positioning of the ECRNA seems particularly favorable for the southern extension of several species and, thus, has value for research into questions about species distribution limits. Madrone, a primarily Northern Californian tree finds the required habitat here as do a few plants of less stature: *Lonicera hispidula*, *Sedum spathulifolium* and *Pterospora andromedea*. Others are likely to be found.

Finally, one rare plant, *Linanthus orcuttii*, includes the Eagle Crag area in its limited range of habitats.

For these reasons the region should be considered suitable for designation as a Research Natural Area.

Adequacy of Proposed Boundaries

The originally suggested boundaries included approximately 163 hectares (400 acres) of bigcone Douglas-fir-canyon live oak forest, montane manzanita chaparral and canyon live oak forest. These have been modified in this proposal in two ways: 1) the bigcone Douglas-fir-canyon live oak forest on the the slope to the south of the manzanita chaparral patch has been added and 2) the canyon live oak patch has been extended slightly to include the madrone groves in the Agua Tibia Creek drainage. These additions bring the total area to 191 hectares (471 acres).

With these modifications the proposed boundaries are more than adequate to allow study of the bigcone Douglas-fir and associated vegetation types (See following section). The range of vegetation types and their quality are exceptional for the limited area of the proposed ECRNA.

The only further alteration that might be considered would entail increasing the area to include the riparian forest in some adjacent lower areas. The present boundaries are drawn along natural breaks in the vegetation type. At lower elevations, particularly along the canyon which leads to Cutca Valley and along Arroyo Seco at the base of the north-facing bowl, extension of the RNA boundaries might significantly increase the species number and chance of finding rare species. Since these areas are currently protected under the designation of Wilderness Area, however, such a move is only tangential to the primary goals of this RNA.

Potential for Research

Two separate patches of the target species are included which might allow comparative or replicated experiments. Also, over 600 m (2000 feet) of altitudinal gradient are

represented on both a mesic, north-facing slope and a more xeric west-facing slope. Such features and including the representation of the other vegetation types makes the proposed ECRNA an ideal site to study the ecological requirements of bigcone Douglas-fir and its relations with other vegetation types.

Stands of the target species, bigcone Douglas-fir, are somewhat of a rarity this far south. The inclusion of the primarily Northern California species, madrone, emphasizes the fact that the ECRNA is also an interesting area to study distributional limits for northern species. That these two are both found here is not coincidence. Several herbaceous species found within the ECRNA are also here as southern range extensions. This suggests that some feature of the ECRNA, most likely its climate and position, allows for the uncharacteristic extension of some northern species.

The ECRNA might have some extra research potential from coincidental product of its location. Two existing preserves dedicated to ecological research are found nearby. The San Diego State University administers both the Santa Margarita Field Station in the coastal mountains to the west and the Sky Oaks Field Station on a large tract of chaparral and Coulter Pine Forest to the east. The ECRNA, lying between these two, might afford an interesting opportunity to do research on vegetation in an east-west transect from the coast to the Anza-Borrego desert.

It might be noted that the ECRNA area has already been used for research on bigcone Douglas-fir. The study of McDonald and Littrell (1976) sampled these stands as the southernmost limit of their study of stand characteristics of the species over its whole range.

Conflicts Facing Management

One conflict which must be addressed in the management of this area is the balance between the ECRNA's remoteness and the difficulty of access which this entails. Its stands as a conflict of use because, on the one hand backpackers, hikers and researchers

would desire greater access to the area, yet at the same time the research potential is increased if the area remains pristine and a safe place to locate equipment or monitoring devices.

The following questions are mentioned as areas of specific concern to managers of the ECRNA.

1) Should new trails be built to allow greater access?

Because of the beauty and remoteness of the ECRNA there is pressure to open greater trail access to the area. Further, for anyone interested in visiting the madrone groves access is currently almost impossible using only public lands.

The costs associated with opening more trails and attracting more visitors include greatly increasing the possibility of man caused fire, the possible general degradation of the area and reducing the aesthetic value of remote or unexplored expanses.

2) What is the best way to manage the small population of *Linanthus orcuttii*?

Since this species seems to be limited to a small area *within the main trail* it seems extremely susceptible to trampling by visitors. One misplaced tent at the wrong time could drastically reduce the *Linanthus* numbers.

3) What about fire control?

This problem faces all forest and shrubland administrators. For an area which is supposed to be "natural" this is even a more vexing problem.

It should be noted that the fuel load of the RNA and surrounding areas, particularly the chaparral, is large due to the long interval since the last fire. Since access is difficult, a fire starting within the wilderness would be difficult to control quickly. It is likely that if a fire started in the Wilderness it could easily devastate the RNA and its BCDF population.

That a fire will occur is inevitable. Fire is, of course, a natural part of forest and shrubland ecology, though, at this point, it is impossible to predict how the vegetation will respond in the postfire period. It is likely that the species composition of the area may be drastically altered, especially if the fire is intense and sweeping. A shift in the relative patch

sizes is possible with possible additions to or subtractions from the current number. Recovery to reproductive maturation, especially for the BCDF, may be a process of tens to hundreds of years.

Specific Suggestions

- 1) The Eagle Crag area has sufficient value as a site of *Pseudotsuga macrocarpa*, southern range extensions and remote beauty that it should be accepted as a Research Natural Area.
- 2) There is no specific recommendation with respect to opening new trails within the ECRNA. Careful consideration must be given on how to weight the conflicting values of maintaining the remoteness of the area against the need for public access.
- 3) Access to the area during the fire-prone season, July until the first winter rains around December, should be limited or, at least, not encouraged. If overnight or casual visitor use increases during drought, the chance of fire starting within the ECRNA increases.
- 4) Potential visitors should be made aware that sensitive plants are found within the trail in the ECRNA and that caution should be taken when hiking through, especially during May and June, the *Linanthus orcuttii* flowering and fruiting period.
- 5) Fire management should be kept to a minimum as should replanting efforts if this is truly to be a "natural area." Use of bulldozers should be stridently prohibited. At best, a "hands off" policy should be adopted.
- 6) If non-forest service investigators are expected to use the area in the future, easier access to the ECRNA might be arranged. A treaty allowing access along the road from the Palomar Observatory Fire Station to the ECRNA boundary would be ideal.

POSTFIRE ADDENDUM

In the beginning of August, 1989, a fire swept through much of the Agua Tibia Wilderness leaving very little above ground vegetation in its wake. Apparently, the forest service mounted an intense effort to reduce the fire's impact on the area of the proposed ECRNA. Even so, large tracts of the ECRNA were burned. While it is beyond the scope of this report to describe in detail the resulting state of the ECRNA vegetation a fairly quick examination of the area was performed by this author into the area shortly after the fire had subsided with the following observations:

- 1) Magee Palomar Trail was bulldozed into a wide fireroad. While the two sites where the endangered *Linanthus orcuttii* were found were not visited by this author, it is my belief that they were most likely plowed under. Because of this activity, the postfire response of *Linanthus* and of the trail corridor will not have scientific value for study of "natural" reestablishment. Because of the expected "fire-follower" life history traits of Orcutt's Linanthus it is expected (or hoped) that the species may show up elsewhere now in the ECRNA.
- 2) Vast quantities of a flame retardant substance were dropped onto chaparral area surrounding Cutca Trail and perhaps other areas as well. Much of the chaparral burned down to ash anyway. But in other areas, while the flame retardant did prevent the above-ground portion of the plant from burning, it did not, however, prevent a low, ground-creeping fire from spreading. Thus, the current physiognomy of the chaparral area includes what looks like a normal, closed-canopy shrub cover but which is, nevertheless, completely dead and detatched from the roots. This seems to be an exceedingly "unnatural" condition and is one which will obviously affect the possibility and condition of regrowth.
- 3) Much of the shrubbery which did survive the fire is coated with a pinkish coating of flame retardant. It is not known by this author whether the substance will have any direct effect on the survival of the vegetation.

4) The fire did sweep through the bigcone Douglas-fir-canyon-live oak forest. As might have been predicted from theory, the fire did not crown and many of the big BCDF were still doing fine at the time of this survey. From what I could see most of the seedlings and saplings were killed as were many of the larger canyon live oak.

Because of fire prevention efforts, it may be difficult to correlate the fire and post-fire response of the vegetation to their life history traits and not to the efforts of the fire personnel.

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APPENDIX I

Figure 1-The location of the ECRNA in Southern California

Figure 2-The location of the ECRNA in San Diego County with Inset

Figure 3-The location of the ECRNA in the Agua Tibia Wilderness

LOCATION MAP

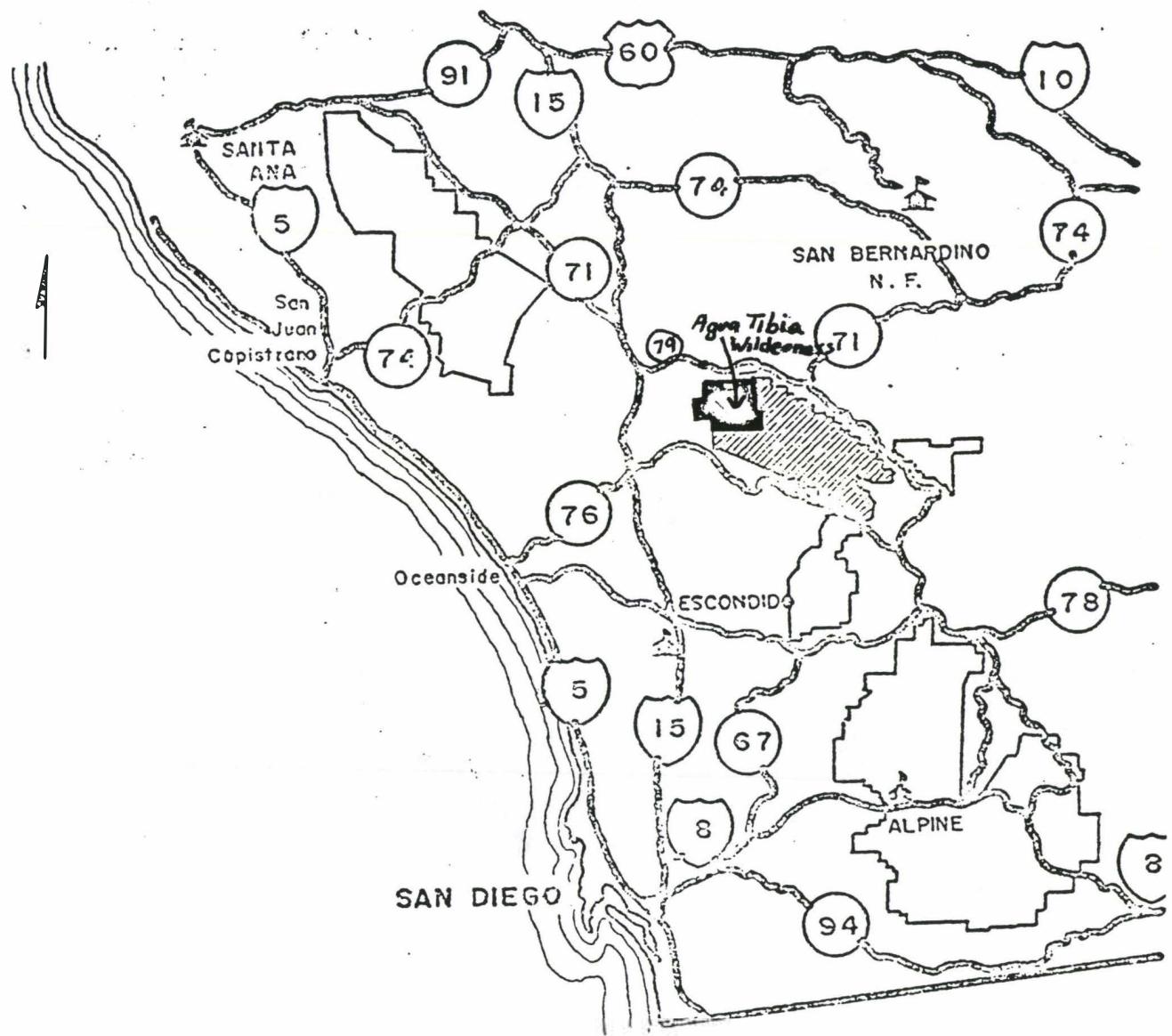


Figure 1

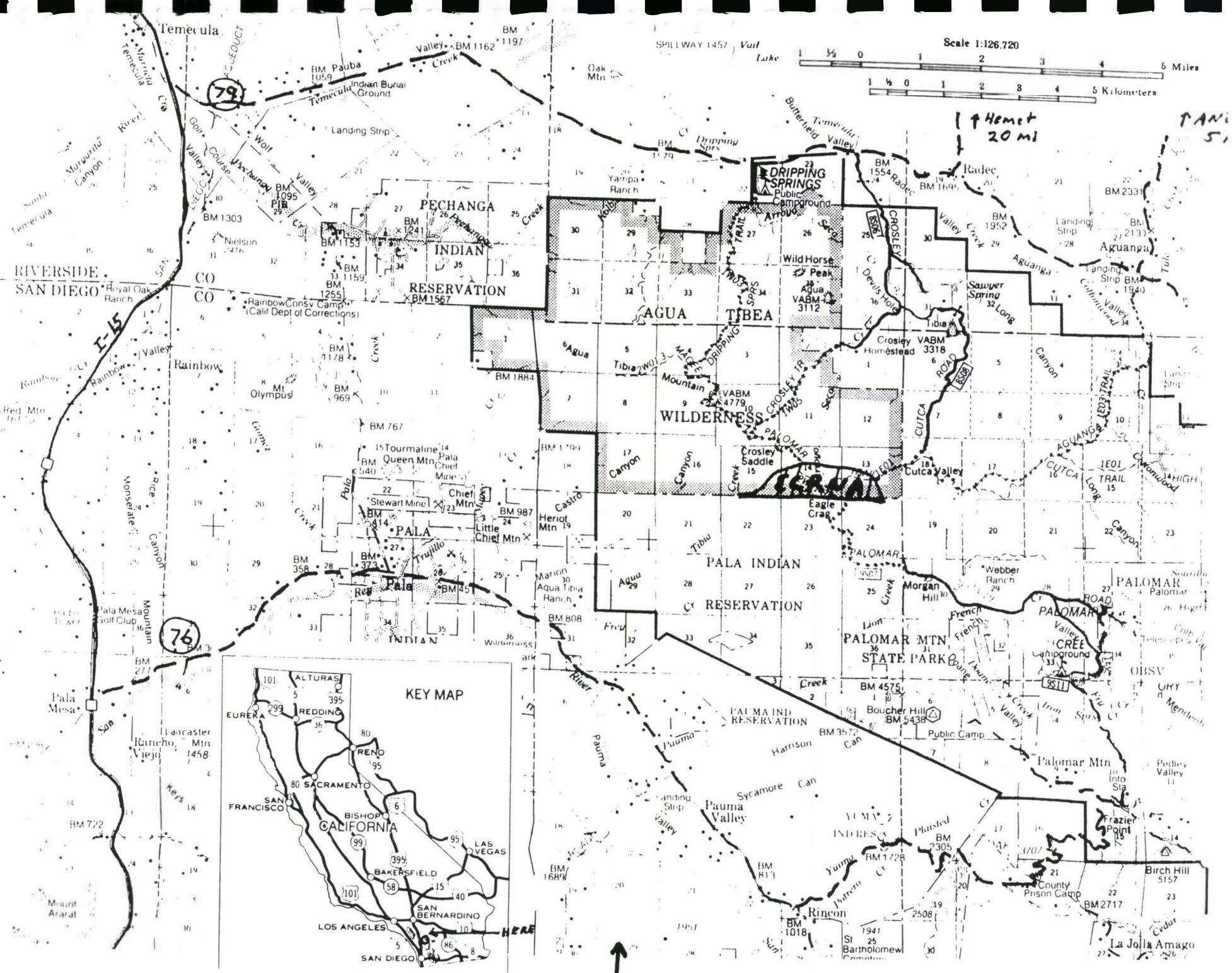


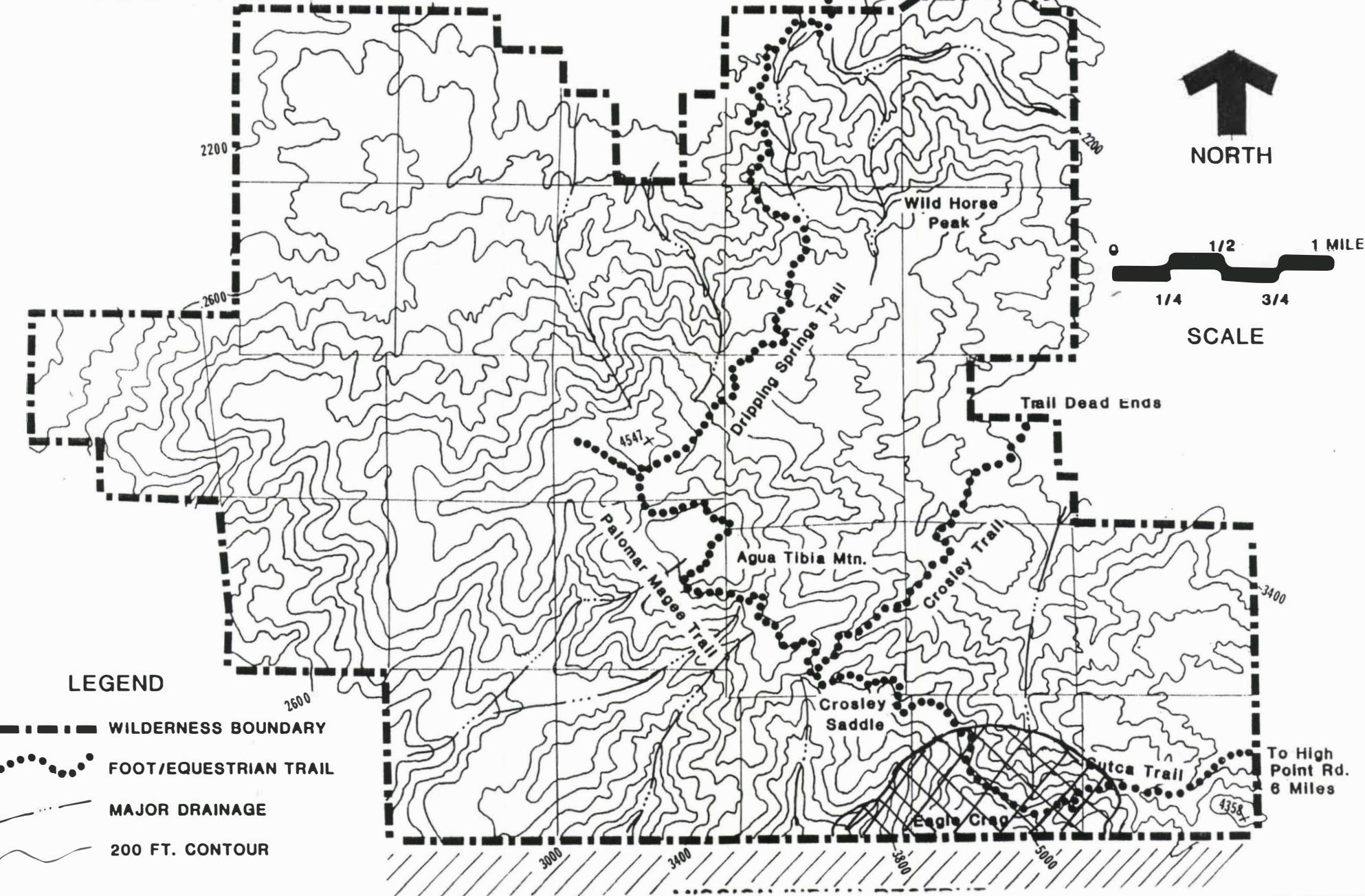
Figure 2

AGUA TIBIA WILDERNESS

Cleveland National Forest

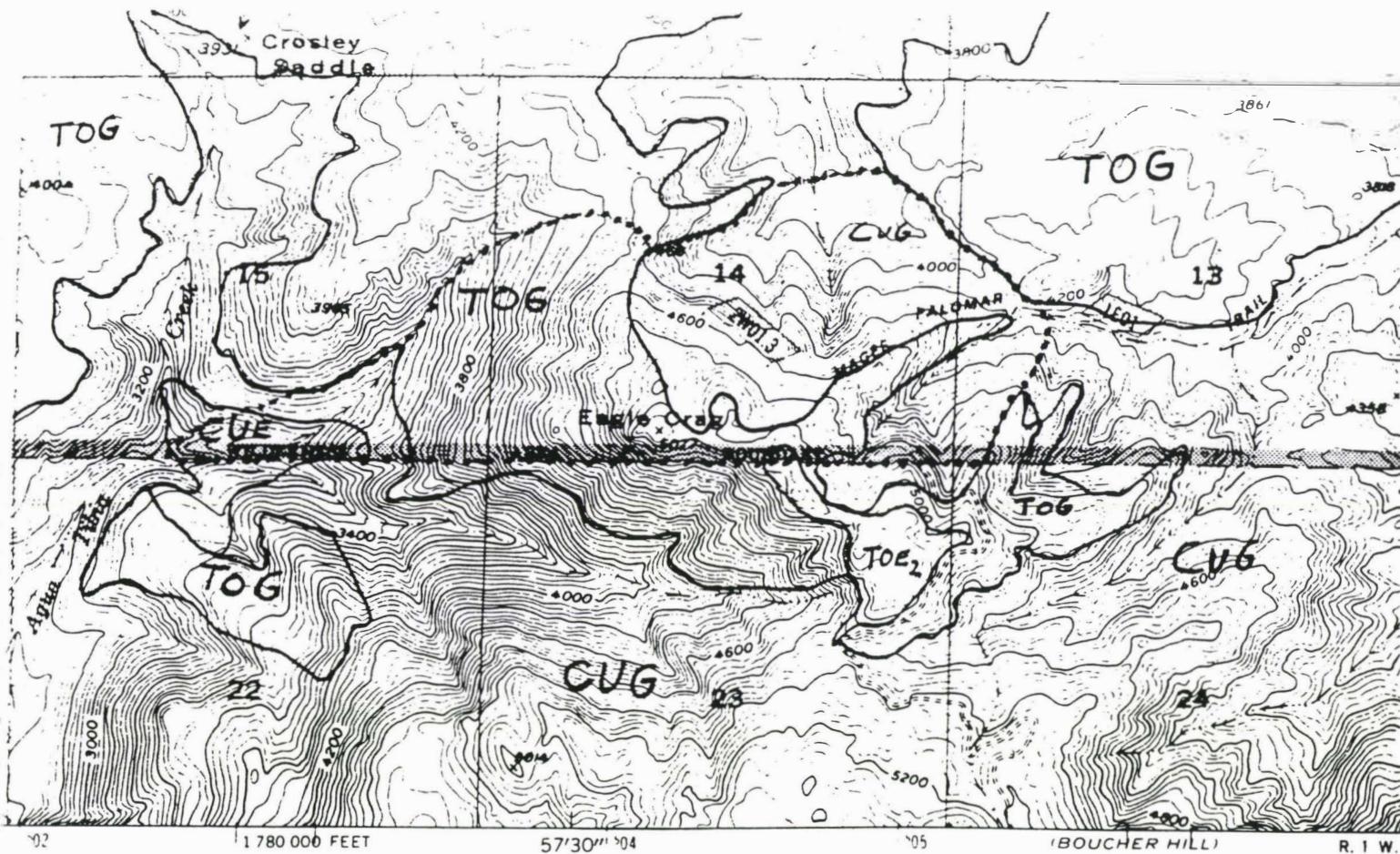
PALOMAR RANGER DISTRICT

TELEPHONE (619) 745-2421



APPENDIX II

Figure 1-Soil map of the ECRNA and some surrounding areas



Dotted Lines- Eagle Crag RNA Boundary
Solid Lines- Soil Types

SOILS

Crouch Series

CuG- rocky, coarse sandy loam
sandy loam

30-70 % slopes.

CuE- rocky, coarse sandy loam
sandy loam

5-30 % slopes

Tollhouse Series

ToG- rocky, coarse

30-65 % slopes.

ToE2 rocky, coarse

5-30 % slopes, eroded.

Adapted & redrawn from: U.S.D.A. 1973. Soil Survey-San Diego Area, California. County of San Diego.

APPENDIX III

Figure 1-Map of vegetation types

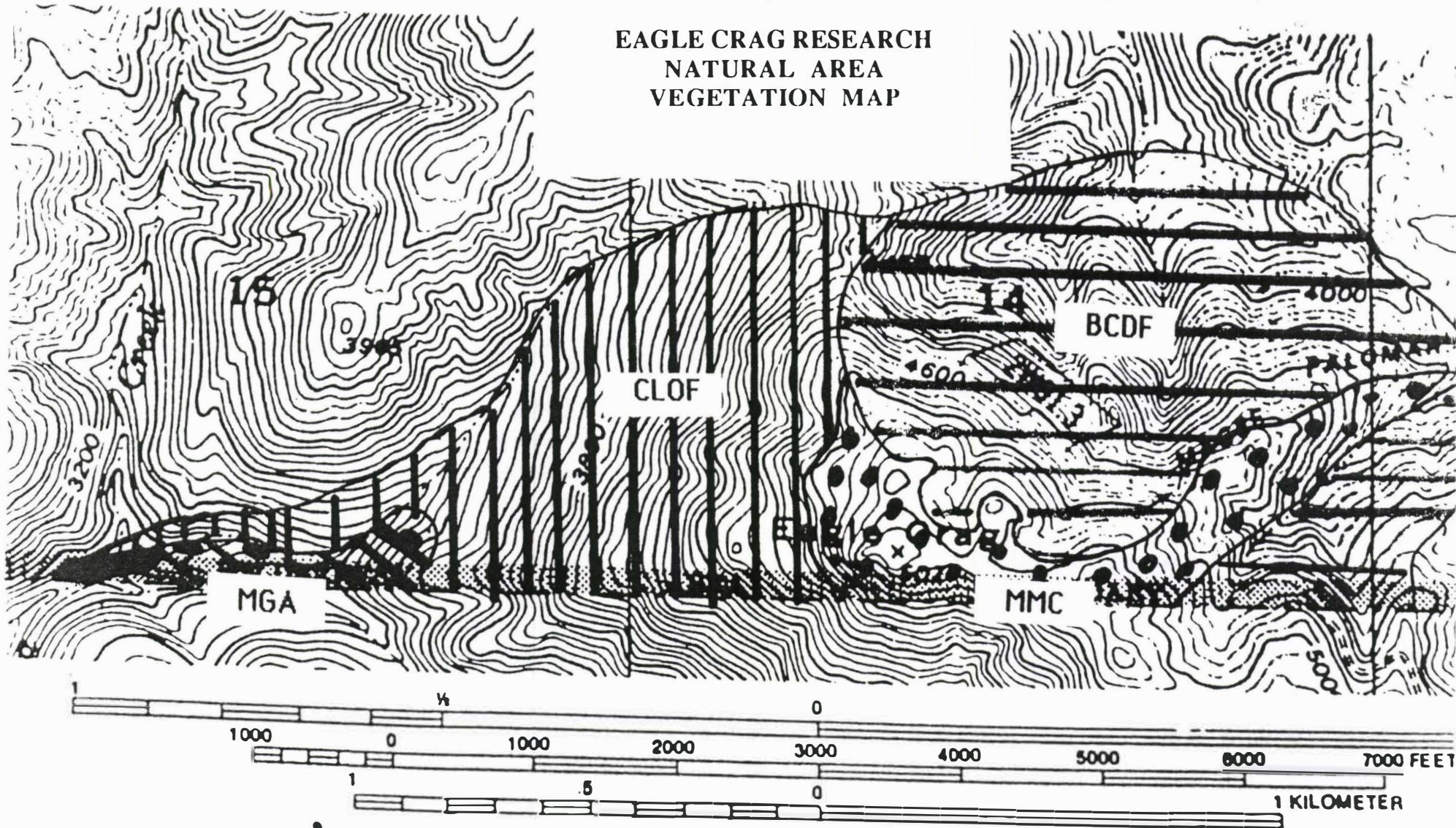
Table 1-Areas of the vegetation types

Table 2-Stand characteristics of the bigcone Douglas-fir-canyon live oak forest

Table 3-Relative abundance in the chaparral patch

Table 4-Core data from *Pseudoptuga macrocarpa*

EAGLE CRAG RESEARCH
NATURAL AREA
VEGETATION MAP



Legend

- BCDF -
- CLOF -
- MMC -
- MGA -

Bigcone Douglas-Fir-Canyon Live Oak Forest
Canyon Live Oak Forest
Montane Manzanita Chaparral
Madrone grove area

Table 1
Areas of Vegetation Types

<u>Vegetation Type</u>	<u>Hectares</u>	<u>Acres</u>	<u>Relative %</u>
Bigcone Douglas-fir-			
Canyon Live Oak Forest	89	220	47
Canyon Live Oak Forest	76	188	40
Montane Manzanita Chaparral	26	64	13
Total	191	472	100

<u>Sub Areas</u>	<u>Hectares</u>	<u>Acres</u>	<u>Relative %</u>
Bigcone Douglas-fir-			
Canyon Live Oak Forest			
Larger patch	64	158	34
Smaller Southern patch	25	62	13
Canyon Live Oak Forest			
Madrone Area	9	22	5

Table 2
Bigcone Douglas-fir Stand Characteristics

# stems per 300 m ²	Douglas-fir	Oak	Total
seedlings	8	163	171
saplings	5	22	27
tree 2.5-10.2	2		2
diam 10.4-30.4	1	7	8
(cm) 30.6-50.8	2		2
51.0-76.2	1		1
76.4 +	1		1
trees (total)	7	7	14
total	20	192	212

Stems/ha

seedlings	267	5433	5700
saplings	167	733	890
trees	233	233	466

Relative Density

seedlings	5%	95%
saplings	18%	82%
trees	50%	50%

Basal Area (m²/ha) 99 12 111

Relative Basal

Area (Trees) 89% 11%

Table 3
Dominant Species of the Chaparral Patch

<u>Species</u>	<u>Number Counted</u>	<u>Occurrence Frequency</u>
<i>Arctostaphylos glandulosa</i>	117	58.0
<i>Quercus chrysolepis</i>	20	10.0
<i>Adenostoma fasciculatum</i>	19	9.5
Open area	11	5.5
<i>Ceanothus leucodermis</i>	10	5.0
<i>Arctostaphylos pringlei drupacea</i>	7	3.5
<i>Quercus wislizenii</i>	7	3.5
<i>Pseudotsuga macrocarpa</i>	6	3.0
<i>Pinus coulteri</i>	3	1.5
<i>Adenostoma sparsifolium</i>	1	.5
 Total sample points	201	100 %

Table 4
 CORE DATA FROM PSEUDOTSUGA MACROCARPA TREES IN THE EAGLE
 CRAG RESEARCH NATURAL AREA

<u>No.</u>	<u>Location</u>	<u>Ring Count</u>	<u>DBH (cm.)</u>
4	Near Cutca Trail 4100 ft.	37	5.2
3	Near Cutca Trail 4100 ft.	42	7.2
2	Near Cutca Trail 4100 ft.	49	15.2
1	Near Cutca Trail 3700 ft.	79	27.2
6	Near Cutca Trail 4100 ft.	96	40.4
8	Near Cutca Trail 4250 ft.	154	49.5
11	Near Cutca Trail 4250 ft.	208	49.8
9	Near Cutca Trail 4250 ft.	225	41.8
5	Near Cutca Trail 4100 ft.	250 (in 25 cm.)	107
7	Above Palomar Divide Rd 4800 ft	287	80
10	Near Cutca Trail 4250 ft.	249 (in 25 cm)	305

APPENDIX IV

List of Vascular Plants

VASCULAR PLANTS OF THE PROPOSED EAGLE CRAG RESEARCH NATURAL AREA

			1 HABITAT ²	COMMENTS
DICOTS				
ACERACEAE				
<i>Acer negundo</i>	L.	CALIFORNIA BOX-ELDER	MRV	Infrequent along streams. The RNA is slightly above usual altitude limit
ssp <i>californicum</i>	(T.&G.)Wesmael			
ANACARDIACEAE				
<i>Toxicodendron radicans</i>	(L.) Kuntze	POISON OAK	BCDF,	Common, especially near canyon bottoms
ssp <i>diversilobum</i>	(T. &G.)Thorne		MRV, MGV	
APIACEAE				
<i>Osmorizha chilensis</i>	H.&A.	MOUNTAIN SWEET-CICELY	* BCDF	Commonly encountered on shaded slopes
<i>Tauschia arguta</i>	(T. &G.)Macbr.	SOUTHERN TAUSCHIA	* BCDF	Occasional understory shrub
ASCLEPIADACEAE				
<i>Asclepias californica</i>	Greene	CALIFORNIA MILKWEED	@ MMC	A patch of this is found in Cutca Trail just below RNA boundary
ASTERACEAE				
<i>Agoseris retrorsa</i>	Benth. (Greene)	SPEAR-LEAF AGOSERIS	* Tr	A few in Magee Palomar Trail
<i>Chaenactis artemisiaefolia</i>	(Harv. & Gray)Gray	ARTEMISIA PINCUSHION	* MMC	Just at boundary of ECRNA and Cutca Trail
<i>Erigeron foliosus</i>	Nutt.	LEAFY DAISY	* BCDF, Tr	Generally common in light gaps
var. <i>foliosus</i>				

¹ An * indicates that a pressed specimen has been preserved at the San Diego State Herbarium.

2 BCDF-Bigcon Douglas Fir-Canyon Live oak Forest MCF-Montane Coniferous Forest
CLOF-Canyon Live Oak Forest MMC-Montane Manzanita Chap

MGV-Madrone Grove Vegetation
MRV-Montane Riparian Vegetation
Tr-Magee palomar Trail

			1 HABITAT ²	COMMENTS
<i>Eriophyllum confertiflorum</i>	(DC.)Gray	GOLDEN YARROW	BCDF	Occasional
var. <i>confertiflorum</i>				
<i>Gnaphalium californicum</i>	DC.	CALIFORNIA EVERLASTING	* Tr	Just a few
<i>Gnaphalium microcephalum</i>	Nutt.	WHITE EVERLASTING	* MMC	Just a few in a sandy area at base of ECRNA and Cutca Trail
<i>Hieracium albiflorum</i>	Hook	HAWKWEED	* BCDF	Common understory plant
BORAGINACEAE				
<i>Cryptantha intermedia</i>	(Gray)Greene	NIEVITAS CRYPTANTHA	* MMC	Just a few in a sandy area at base of ECRNA and Cutca Trail
CAMPANULACEAE				
<i>Lobelia dunnii</i>	Greene	ROTHROCK'S LOBELIA	* MRV	Rare along Agua Tibia Creek near RNA boundary.
var. <i>serrata</i>	(Gray)McVaugh			
CAPRIFOLIACEAE				
<i>Lonicera hispidula</i>	(Lindl.)Dougl. ex T&G	CALIFORNIA HONEYSUCKLE	* MRV	Infrequent, but found along Agua Tibia creek & in BCDF bowl near the RNA
var. <i>vacillans</i>	Gray			
<i>Lonicera subspicata</i>	H.&A.	SAN DIEGO HONEYSUCKLE	MRV	Infrequent in drier zones near canyon bottoms
var. <i>denudata</i>	Rehd			
<i>Lonicera subspicata</i>	H.&A.	SOUTHERN HONEYSUCKLE	* MRV	Occasional along stream beds at lower elevations
var. <i>johnstonii</i>	Keck.			
CARYOPHYLLACEAE				
<i>Silene lemmonii</i>	Wats.	LEMMON'S PINK	* BCDF, Tr	Common ground cover

CISTACEAE

1 An * indicates that a pressed specimen has been preserved at the San Diego State Herbarium

2 BCDF-Bigcon Douglas Fir-Canyon Live oak Forest MCF-Montane Coniferous Forest
 CLOF-Canyon Live Oak Forest MMC-Montane Manzanita Chap MGV-Madrone Grove Vegetation
 MRV-Montane Riparian Vegetation Tr-Magee palomar Trail

			1 HABITAT ²	COMMENTS
<i>Helianthemum scoparium</i> var. <i>aldersonii</i>	Nutt. (Greene) Munz	ROCK-ROSE	MMC	On the trail to Eagle cragg above Magee Palomar trail-open area
CRASSULACEAE				
<i>Dudleya pulverulenta</i>	(Nutt.) Britt. & Rose	CHALK LIVE-FOREVER	BCDF	One plant seen in bowl on east side
<i>Dudleya saxosa</i> ssp <i>aloides</i>	(Jones) Britt. & Rose (Rose) Moran	DESERT SAVIOR	* MMC	Rocky, sandy area below corner RNA boundary along Cutca Trail.
<i>Sedum spathulifolium</i> ssp <i>yosemitense</i>	Hook (Britt.) Clausen	YOSEMITE STONECROP	@ BCDF, Tr	Common on open slopes
ERICACEAE				
<i>Arbutus menziesii</i>	Pursh.	MADRONE	* MGV, CLOF	Area somewhat chaparral, riparian, and oak forested Along Agua Tibia Creek
<i>Arctostaphylos glandulosa</i> ssp <i>glandulosa</i>	Eastwood	EASTWOOD MANZANITA	MMC, CLOF	Dominant species
<i>Arctostaphylos pringlei</i> ssp <i>triglochae</i>	Parry (Parry) Wells	CUYAMACHA MANZANITA	@ MMC, Tr, CLOF	Common arborescent species
<i>Chimaphila menziesii</i>	(R. Br. ex D. Don) Spreng	LITTLE PRINCES PINE	* BCDF	Fairly common understory species. Near southern range limit.
<i>Pterospora andromedea</i>	Nutt.	PINE-DROPS	* BCDF	Only seen at one location at 4200' about 100 m. north of Cutca Trail
<i>Rhododendron occidentale</i>	(T&G) Gray	WESTERN AZALEA	@ MRV	Fairly common at more moist sites
FABACEAE				
<i>Lathyrus laetiflorus</i> ssp <i>alefeldii</i>	Greene (White) Brads.	SAN DIEGO SWEETPEA	@ Tr	Along Magee palomar Trail at northern RNA boundary
1 An * indicates that a pressed specimen has been preserved at the San Diego State Herbarium				
2 BCDF-Bigcone Douglas Fir-Canyon Live oak Forest	MCF-Montane Coniferous Forest		MGV-Madrone Grove Vegetation	
CLOF-Canyon Live Oak Forest	MMC-Montane Manzanita Chap		MRV-Montane Riparian Vegetation	
			Tr-Magee palomar Trail	

			1 HABITAT ²	COMMENTS
<i>Lotus argophyllus</i>	(Gray) Greene	SILVER-LEAF LOTUS	@ Tr	Common
ssp <i>argophyllus</i>				
<i>Lotus scoparius</i>	(Nutt. in T.&G.) Ottley	DEERWEED	Ch	Near Cutca and Magee palomar Trail intersection
ssp <i>brevialatus</i>	(Ottley) Munz			
<i>Lotus strigosus</i>	(Nutt. in T.&G.) Greene	HIRSUTE LOTUS	@ Tr	
var. <i>hirtella</i>	(Greene) Ottley			
<i>Lupinus concinnus</i>	Agardh	BAJADA LUPINE	@ Tr	
ssp <i>obtusus</i>	(C.P. Smith) D. Dunn			
<i>Lupinus excubitus</i>	Jones	GUARD LUPINE	@ BCDF, Tr	
var. <i>austromontanus</i>	(Heller) C. P. Sm.			
FAGACEAE				
<i>Quercus agrifolia</i>	Nees	CALIFORNIA LIVE OAK	MRV	Rare, only a few trees along east side drainages
var. <i>agrifolia</i>				
<i>Quercus chrysolepis</i>	Liebm.	CANYON LIVE OAK	BCDF	Dominant species
<i>Quercus dumosa</i>	Nutt.	SCRUB OAK		
<i>Quercus wislizenii</i>	A. DC.	INTERIOR LIVE OAK	Ch	Scattered individuals
var. <i>frutescens</i>	Englem.			
HYDROPHYLACEAE				
<i>Phacelia distans</i>	Benth.	COMMON PHACELIA	MMC	
<i>Phacelia imbricata</i>	Greene	IMBRICATE PHACELIA	Tr	
ssp. <i>patula</i>	(Brand) Heckard			

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2 BCDF-Bigcone Douglas Fir-Canyon Live oak Forest MCF-Montane Coniferous Forest
CLOF-Canyon Live Oak Forest MMC-Montane Manzanita Chap
MGV-Madrone Grove Vegetation
MRV-Montane Riparian Vegetation
Tr-Magee palomar Trail

		1 HABITAT ²		COMMENTS
<i>Phacelia parryi</i>	Torr.	PARRY'S PHACELIA	MMC	On a sandy slope at base of ECRNA and Cutca Trail
<i>Phacelia SP.</i>			* MMC	
<i>Phacelia suffrutescens</i>	Parry	WILD-HELIOTROPE	* MGV, MRV	At RNA boundary and Agua Tibia Creek. More common at lower
LAMIACEAE				
<i>Monardella macrantha</i> ssp <i>macrantha</i>	Gray	SCARLET MONARDELLA	* BCDF	Occasional throughout area. None of the rare ssp. <i>hallii</i> was observed.
<i>Stachys rigida</i> ssp <i>rigida</i>	Nutt. ex Benth.	HEDGE-NETTLE	* MRV	At RNA boundary and Agua Tibia Creek. More common at lower
ONAGRACEAE				
<i>Clarkia rhomboidea</i>	Dougl. ex Hook	DIAMOND CLARKIA	* Tr, BCDF	Occasional and widespread
<i>Zauschneria californica</i> ssp <i>californica</i>	Presl.	CALIFORNIA FUSCHIA	* MRV	Occasional on drier sites
PAPAVERACEAE				
<i>Dendromecon rigida</i> ssp <i>rigida</i>	Benth.	BUSH POPPY	CLOF	Only a few encountered, scattered on the west side slopes
PLATANACEAE				
<i>Platanus racemosa</i>	Nutt.	CALIFORNIA SYCAMORE	MRV	Occasional along stream beds
POLEMONIACEAE				
<i>Gilia capitata</i> ssp <i>abrotanifolia</i>	Sims (Nutt. ex Greene) V. Grant	GLOBE GILIA	MMC	In a sandy area at base of ECRNA and Cutca Trail

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			1 HABITAT ²	COMMENTS
<i>Gilia exilis</i>	Gray	NAMELESS GILIA	* BCDF	Seen near cutca trail where it comes out of the chaparall and meets the
<i>Linanthus floribundus</i> ssp <i>glabrus</i>	(Gray) Greene ex Milken. R. Patterson	SUMMER SNOW	* BCDF, Tr	Common in dry areas just about everywhere
<i>Linanthus orcuttii</i>	(Parry & Gray) Jeps.	LAGUNA LINANTHUS	* Tr	Only seenin trail near northern boundary of RNA. See text
POLYGONACEAE				
<i>Chorizanthe leptotheca</i>	Goodm.	RAMONA SPINE-FLOWER	* Ch	In a sandy area at base of ECRNA and Cutca Trail
<i>Eriogonum fasciculatum</i> ssp <i>foliosum</i>	Benth. (Nutt.) S. Stokes	FLAT-TOPPED BUCKWHEAT	* MMC	Occasional above Magee Palomar Trail
PORTULACEAE				
<i>Claytonia perfoliata</i> var. <i>parviflora</i>	Donn (Dougl. ex Hook.) Torr. Hook.) Torr.	NARROW-LEAF MINERS' LETTUCE	* BCDF	Moist areas
<i>Claytonia spathulata</i> var. <i>exigua</i>	Dougl. ex Hook (T&G)Piper	SERPENTINE MONTIA	MRV	Moist areas
RANUNCULACEAE				
<i>Aquilegia formosa</i> <i>truncata</i>		CALIFORNIA COLUMBINE	* MGV	Seen in dry stream bed
<i>Delphinium patens</i> ssp <i>hepaticoideum</i>	Benth. Ewan	LIVER-LEAF LARKSPUR	* BCDF	On shades slope with Sedum and Collinsia
RHAMNACEAE				
<i>Ceanothus greggii</i> ssp <i>perplexans</i>	Gray (Trel.)Beauchamp	CUPLEAF CEANOTHUS	MMC	Found only rarely in chaparral near the divide north of Eagle Cragg

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CLOF-Canyon Live Oak Forest

MGV-Madrone Grove Vegetation

MRV-Montane Riparian Vegetation

Tr-Magee palomar Trail

			1 HABITAT ²	COMMENTS
<i>Ceanothus leucodermis</i>	Greene	CHAPARRAL WHITETHORN	MMC, CLOF	Patchily distributed in chaparral and Oak forest
<i>Ceanothus oliganthus</i>	Nutt. ex. T. & G.	HAIRY CEANOTHUS	* CLOF, MMC, BCDF	Occasional on east side above Magee Palomar Trail and on west side of
<i>Rhamnus californica</i> ssp <i>tomentella</i>	Esch. (Benth.)C.B. Wolf	COFFEEBERRY	@ BCDF, CLOF, MMC, Tr,	Infrequent but well distributed
<i>Rhamnus ilicifolia</i>	Kell.	HOLLY-LEAFED REDBERRY	BCDF, CLOF, MGV	
ROSACEAE				
<i>Adenostoma fasciculatum</i>	H.&A.	CHAMISE	MMC	Occasional to common
<i>Adenostoma sparsifolium</i>	Torr.	RED SHANK	MMC	Infrequent
<i>Heteromeles arbutifolia</i> ssp <i>arbutifolia</i>	(Ait.)M. Roem.	TOYON	MRV	Rarely found along streambeds
<i>Potentilla glandulosa</i> ssp <i>glandulosa</i>	Lindl.	STICKY CINQUEFOIL	BCDF	Infrequent
<i>Prunus ilicifolia</i>	(Nutt.)Walp.	HOLLY-LEAVED CHERRY	* MGV	A few individuals in chaparral like understory of madrones
<i>Rubus parviflorus</i>	Nutt.	THIMBLEBERRY	MRV	Infrequent at best. Only seen along stream bed S. of Cutca Trail near their
<i>Rubus ursinus</i>	Cham. & Schlecht	BLACKBERRY	* MRV, MGV	Abundant
RUBIACEAE				
<i>Galium angustifolium</i> ssp <i>angustifolium</i>	Nutt. ex T&G	BEDSTRAW	BCDF, Tr	Occasional

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			1 HABITAT ²	COMMENTS
<i>Galium aparine</i>	L.	COMMON BEDSTRAW	BCDF	Infrequent
SALICACEAE				
<i>Populus trichocarpa</i> <i>trichocarpa</i>	T&G	BLACK COTTONWOOD	* MRF	One tree seen in a canyon on the east side
<i>Salix lasiolepis</i> var. <i>bracelinea</i>	Benth. Ball	BRACELIN'S WILLOW	MRF	Along canyon at base of bowl
SAXIFRAGACEAE				
<i>Ribes amarum</i>	McClat.	BITTER GOOSEBERRY	MRV	Not nearly as abundant as nevadense
<i>Ribes nevadense</i>	Kell.	SIERRA CurrANT	MRV	Common along most canyons
SCROPHULARIACEAE				
<i>Antirrhinum coulterianum</i>	Benth. in A. DC.	WHITE SNAPDRAGON	MGV	Just a few seen
<i>Castilleja affinis</i> ssp <i>affinis</i>	H. & A.	COAST PAINT-BRUSH	@ Tr	
<i>Castilleja martini</i> <i>martini</i>	Abrams	MARTIN'S PAINTBRUSH		
<i>Collinsia heterophylla</i> var. <i>heterophylla</i>	Buist ex. Grah.	PURPLE CHINESE HOUSES	* Tr	
<i>Collinsia</i> SP.	?	BLUE-EYED MARY	BCDF	Most likely heterophylla, but could be concolor. Not collected
<i>Cordylanthus filifolius</i>	Nutt. ex Benth.	DARK-TIP BIRD'S BEAK	* MMC	One patch in Cutca trail near RNA border

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			1	HABITAT ²	COMMENTS
<i>Diplacus aurantiacus</i>	(Curt.)Jeps.	SAN DIEGO MONKEY FLOWER	*	BCDF, MGV	Along some canyon slopes
ssp <i>australis</i>	(McMinn)Beeks ex Thorne				
<i>Diplacus longiflorus</i>	(Nutt.) Grant	SALMON MONKEY FLOWER	MMC		Amongst rocks of Eagle Cragg
ssp <i>longiflorus</i>					
<i>Keckiella cordifolia</i>	(Benth.)Straw.	HEART-LEAVED PENSTEMON	*	MRV, MGV	
<i>Keckiella ternata</i>	(Torr. ex Gray) Straw	SUMMER BUSH PENSTEMON	*	BCDF, MGV	
ssp <i>ternata</i>					
<i>Mimulus brevipes</i>	Benth.	WIDE-THROAT MONKEY FLOWER	*	MMC	Dry, open slopes
<i>Mimulus cardinalis</i>	Dougl. ex Benth.	SCARLET MONKEY FLOWER	*	MRV	Near base of RNA in Agua Tibia creek
<i>Mimulus guttatus</i>	Fisch. ex DC.	SEEP MONKEY FLOWER	*	MRV	Near base of RNA in Agua Tibia creek
ssp <i>guttatus</i>					
SOLANACEAE					
<i>Solanum douglasii</i>	Dunal in DC.	DOUGLAS' NIGHTSHADE	MRV		Lower elevations Agua Tibia Creek. Just barely extends into RNA
STYRACACEAE					
<i>Styrax officinalis</i>	L.	SNOWDROP BUSH	*	CLOF	Infrequent, shaded areas near Madrone groves.
ssp <i>fulvescens</i>	(Eastw.)Beauchamp ex Thorne				
URTICACEAE					
<i>Urtica dioica</i>	L.	HOARY NETTLE	MRV		At junction of RNA boundary and Agua Tibia Creek
ssp <i>holosericea</i>	(Nutt.)Thorne				
VISCACEAE					

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			1 HABITAT ²	COMMENTS
<i>Arceuthobium campylopodum</i>	Engelm. ex Gray	WESTERN DWARF MISTLETOE	* MMC	On Coulter pine
<i>Phoradendron villosum</i>	(Nutt. ex T & G) Nutt.	HAIRY MISTLETOE	* BCDF	On Canyon Live Oak
CONIFERS				
CUPRESSACEAE				
<i>Calocedrus decurrens</i>	(Torr.) Florin	INCENSE CEDAR	MRV	Scarce along canyon bottoms
PINACEAE				
<i>Pinus coulteri</i>	D. Don	COULTER PINE	MMC	Was common on flatter and higher chaparral areas. Severe bark beetle
<i>Pinus jeffreyi</i>	Grev. & Balf. ex A. Murr.	JEFFREY PINE	BCDF	Apparently only one tree at base of Cutca Tail and RNA boundary. P.
<i>Pseudotsuga macrocarpa</i>	(Vasey) Mayr	BIG-CONE DOUGLAS FIR	BCDF	Dominant species on east side (north facing slopes)
FERNS				
ASPIDIACEAE				
<i>Dryopteris arguta</i>	(Kaulf.) Watt	WOODFERN	* BCDF	Common
<i>Polystichum imbricans</i> ssp <i>imbricans</i>	(D.C. Eaton) Wagner	SWORD FERN	* BCDF	Fairly common
PTERIDACEAE				

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			1 HABITAT ²	COMMENTS
<i>Cheilanthes covillei</i>	Maxon	COVILLE'S LIPFERN	* MMC	Amongst the granite rocks of Eagle Cragg in crevices
<i>Pellea mucronata</i>	(D.C. Eaton) Wagner	BIRD'S FOOT FERN	MMC	On an open slope near base of ECRNA and Cutca Trail
MONOCOTS				
AGAVACEAE				
<i>Yucca whipplei</i> ssp. <i>whipplei</i>	Torr.	OUR LORD'S CANDLE	MMC	Occasional along Cutca Trail
AMARYLLIDACEAE				
<i>Dichelostomma pulchella</i>	(Salisb.)Heller	BLUE DICKS	BCDF	Locally common near bottom of bowl on east side
CYPERACEAE				
<i>Carex sp.</i>		SEDGE	* BCDF	common in understory
LILIACEAE				
<i>Lilium humboldtii</i> var. <i>ocellatum</i>	Roezl & Leichtl. (kell.)Elwes	RED-EYED TIGER LILLY	* MRV	Along stream near Madrone groves.
POACEAE				
<i>Bromus orcuttianus</i> var. <i>hallii</i>	Vasey Hitchc. in Jeps.	HALL'S BROME	* BCDF	Occasional in understory. Palomar Mt. is southernmost range for ssp.
<i>Bromus tectorum</i> *	L.	CHEAT-GRASS BROME	* Tr	One of only two introduced species found in the ECRNA
<i>Vulpia myuros</i> * var. <i>hirsuta</i>	L.(K.C. Gmelin) Hack.	FOXTAIL FESCUE	* Tr	Brought up by hikers?

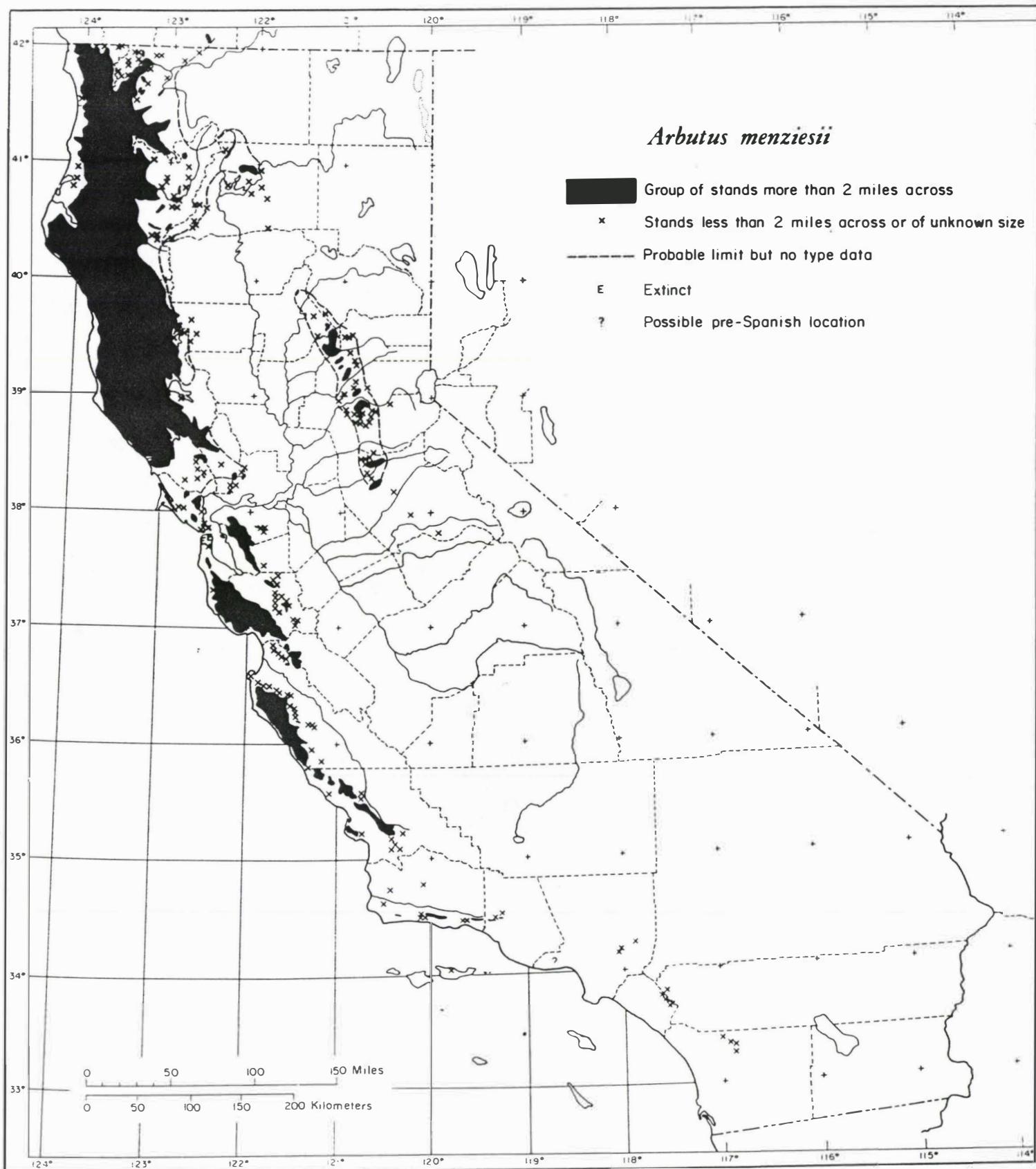
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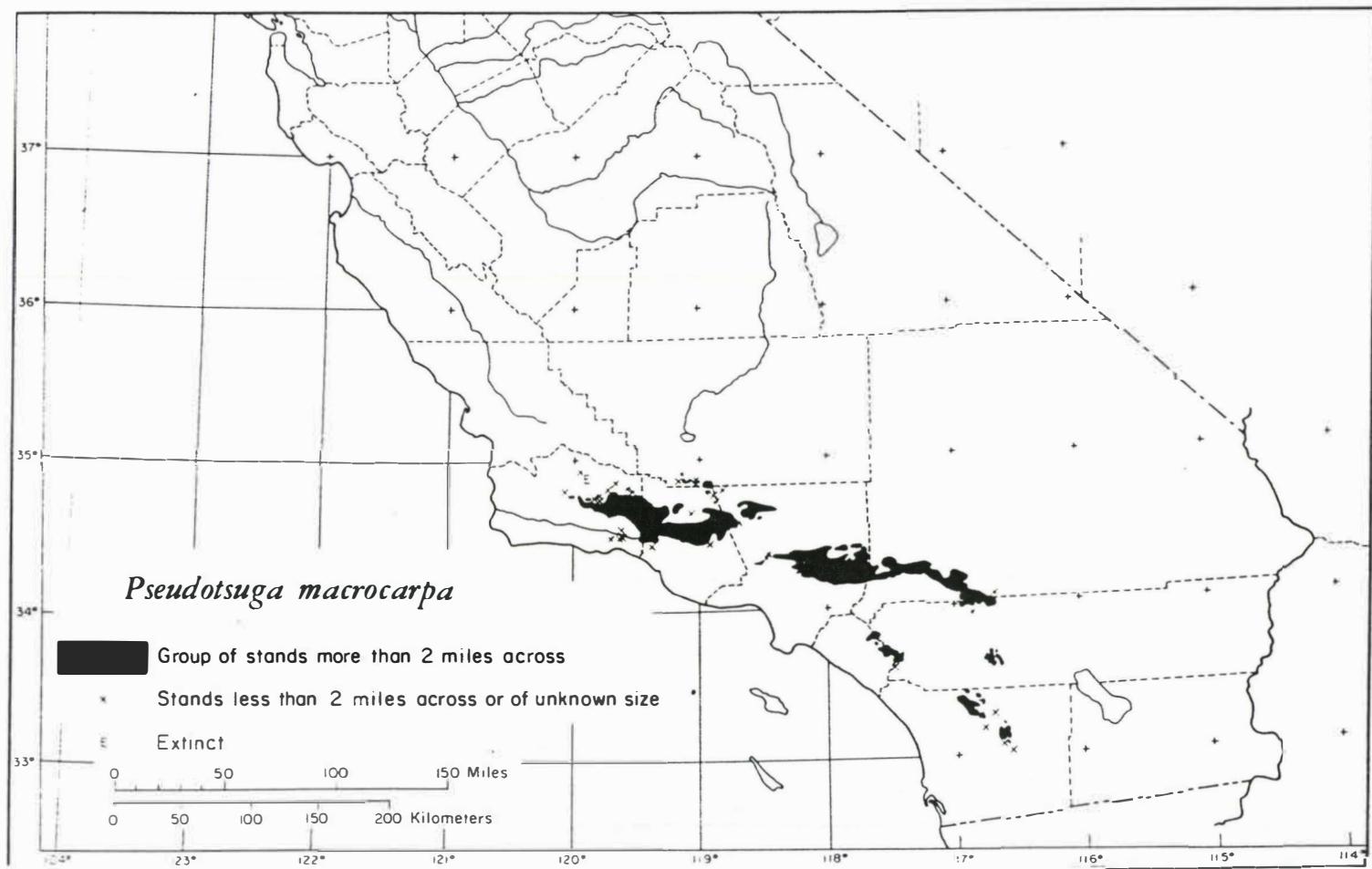
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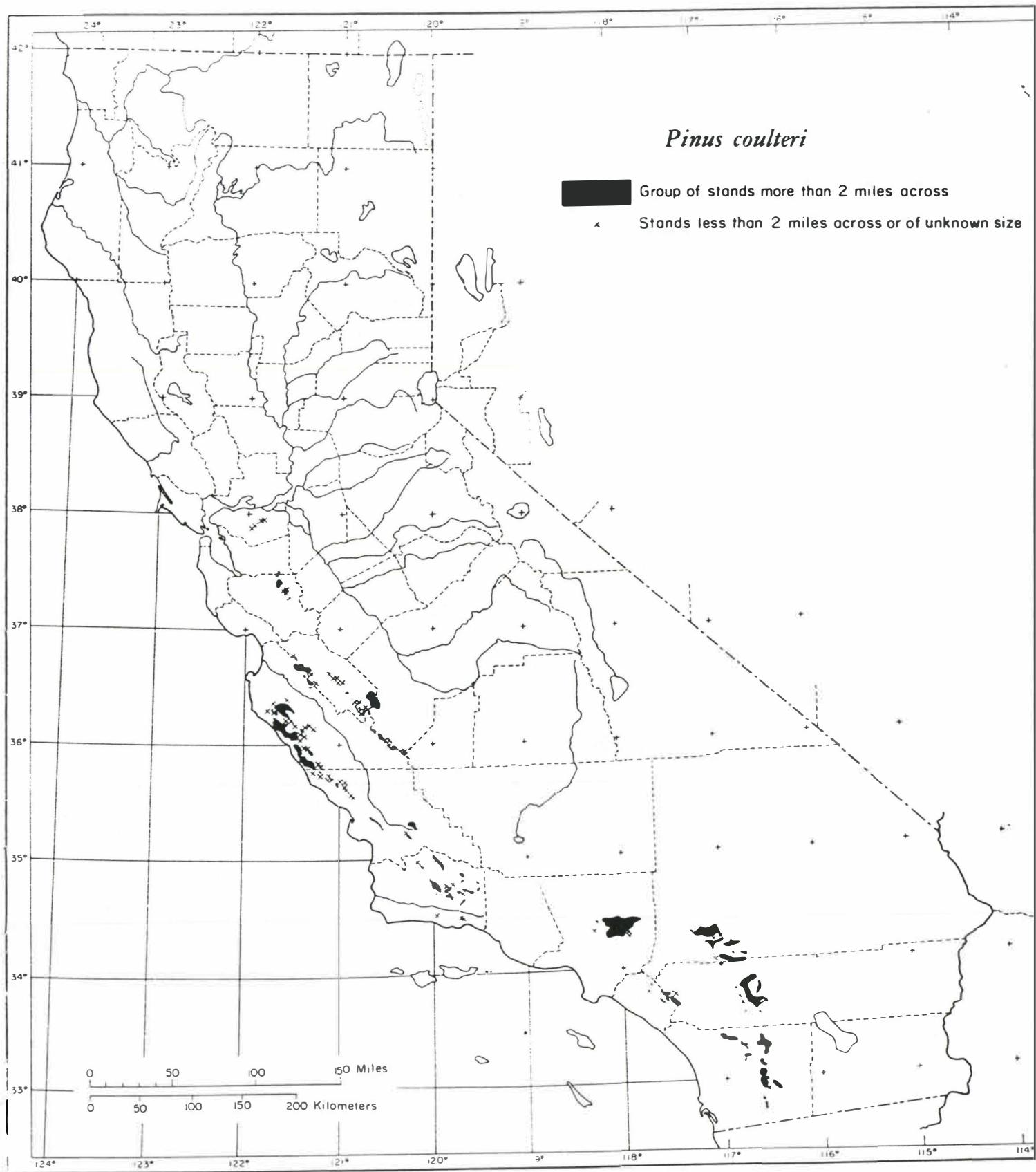
APPENDIX V

Range of *Arbutus menziesii*, *Pseudoptuga macrocarpa* and *Pinus coulteri* in California¹

¹/From: Griffin, James R. and William B. Critchfield. 1972. The Distribution of Forest Trees in California. USDA Forest Service Res. Paper. PSW-82. 118 p.







APPENDIX VI

List of Birds Sighted or Predicted

CHECKLIST OF BIRDS IN THE
EAGLE CRAG RESEARCH NATURAL AREA

Compiled by Nils Warnock and Chris Frazier

<u>Common Name</u>	<u>Scientific Name</u>	<u>Page#¹</u>	<u>OBSERVED OR</u>	<u>PREDICTED</u>
			<u>HABITAT²</u>	
Turkey Vulture	<i>Cathartes aura</i>	182	A	O
Golden Eagle	<i>Aquila chysaetos</i>	184	A,F	P
Sharp-shinned Hawk	<i>Accipiter striatus</i>	190	O,F	P
Broad-winged Hawk	<i>Buteo platypterus</i>	192	F	P
Red-tailed Hawk	<i>Buteo jamaicensis</i>	194	A	O
Prairie Falcon	<i>Falco mexicanus</i>	204	A	O
California Quail	<i>Callipepla californica</i>	218	OB	O
Mountain Quail	<i>Oreortyx pictus</i>	218	OB	O
Band-tailed Pidgeon	<i>Columba fasciata</i>	224	F	O
Spotted Owl	<i>Strix occidentalis</i>	240	F	
Northern Saw-whet Owl	<i>Aegolius acadicus</i>	246	O,F	O
Anna's Hummingbird	<i>Calypte anna</i>	258	CH	O

Allen's Hummingbird	<i>Selasphorus sasin</i>	260	CB	O
Northern Flicker	<i>Colaptes auratus</i>	264	CB	O
Acorn woodpecker	<i>Melanerpes formicivorus</i>	266	CB	O
Nuttall's Woodpecker	<i>Picoides nuttallii</i>	272	CB	O
Ash-Throated Flycatcher	<i>Myiarchus cinerascens</i>	282	CH,CB	O
Olive-sided Flycatcher	<i>Contopus borealis</i>	284	CH,CB	O
Western Wood-PeeWee	<i>Contopus sordidulus</i>	284	CH,CB	O
Violet-Green Swallow	<i>Tachycineta cyaneoviridis</i>	296	A	O
Scrub Jay	<i>Aphelocoma coerulescens</i>	300	CH	O
Stellar's Jay	<i>Cyanocitta stelleri</i>	302	CB	O
Plain Titmouse	<i>Parus inornatus</i>	308	CH,F	O
Wrentit	<i>Chamaea fasciata</i>	308	CH,F	O
Mountain Chickadee	<i>Parus gambeli</i>	310	F	O
Bushtit	<i>Psaltriparus minimus</i>	312	CB	O
Brown Creeper	<i>Certhia americana</i>	314	CB	O
White-breasted				
Nuthatch	<i>Sitta carolinensis</i>	314	F	O
Canyon Wren	<i>Catherpes mexicanus</i>	318	O,CH	O
Blue-Grey Gnatcatcher	<i>Polioptila caerulea</i>	322	CH	?

Black-tailed

Gnatcatcher	<i>Polioptila melanura</i>	322	CH	?
Gnatcatcher	<i>Polioptila sp.</i>	322		O
Western Bluebird	<i>Sialia mexicana</i>	324	CH	O
Phainopepla	<i>Phainopepla nitens</i>	344	A	O
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	380	CH	O
Rufous-sided Towhee	<i>Pipilo erythrrophthalmus</i>	386	CH	O
Song Sparrow	<i>Melospiza melodia</i>	392	CH	O
Dark-eyed Junco	<i>Junco hyemalis</i>	402	F	O
Fox Sparrow	<i>Passerella iliaca</i>	406	CH	O
Western Tanager	<i>Piranga ludoviciana</i>	430	F	O
Lesser Goldfinch	<i>Carduelis psaltria</i>	434	CB,CH,F	O
House Finch	<i>Carpodacus mexicanus</i>	440	CH	O

¹from National Geographic Society

Field Guide to the Birds of North America,

2nd edition, 1987

² A-AIR SPACE OVER VEGETATION

CB-CANYON BOTTOM

CH-CHAPARRAL

O-OAK FOREST

F-BIGCONE DOUGLAS-FIR FOREST

APPENDIX VI

List of Likely Reptiles and Amphibians

Possible Reptiles and Amphibians of the Eagle Cragg RNA
prepared by Brad Hollingsworth

Order Anura

Family Bufonidae

O *Bufo boreas halophilus* Western Toad
P *Bufo microscaphus californicus* Southwestern Toad

Family Hylidae

@ P *Hyla cadaverina* California Treefrog
L *Hyla regilla hypochondriaca* Pacific Treefrog

Family Pelobatidae

P *Scaphiopus hammondii* Western Spadefoot

Family Ranidae

L *Rana aurora draytonii* California Red-legged Frog
L *Rana catesbeina* Bullfrog
L *Rana muscosa* Mountain Yellow-legged Frog

Order Chelonia

Family Emydidae

* P *Clemmys marmorata* Southwestern Pond Turtle

Order Squamata

Family Annulidae

P *Anniella pulchra* California Legless Lizard

Family Anquidae

L *Gerrhonotus multicarinatus webbi* Southern Alligator Lizard

Family Boidae

L *Lichanura trivirgata roseofusca* Coastal Rosy Boa

Family Colubidae

L *Hypsiglena torquata* Night Snake
L *Rhinocheilus lecontei lecontei* Western Long-nosed Snake
L *Tantilla planiceps* California Black-headed Snake
* L *Thamnophis hammondii hammondii* Two-striped Garter Snake
* L *Thamnophis sirtalis infernalis* Red-sided Garter Snake
L *Trimorphodon biscutatus vandenburghii* California Lyre Snake

Family Colubridae

L <i>Arizona elegans occidentalis</i>	Glossy Snake
L <i>Coluber constrictor mormon</i>	Western Yellow-bellied Racer
L <i>Diadophis punctatus similis</i>	Ringneck Snake
L <i>Lampropeltis getulus californiae</i>	California Kingsnake
L <i>Lampropeltis zonata pulchra</i>	San Diego Mountain Kingsnake
P <i>Masticophis flagellum piceus</i>	Coachwhip
L <i>Masticophis lateralis lateralis</i>	California Whipsnake
L <i>Pituophis melanoleucus annexens</i>	Gopher Snake
L <i>Salvadora hexalepis virgutea</i>	Western Patch-nosed Snake

Family Eublepharidae

L <i>Coleonyx variegatus abbottii</i>	San Diego Banded Gecko
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Family Iguanidae

O <i>Sceloporus occidentalis biseriatus</i>	Western Fence Lizard
O <i>Sceloporus orcutti</i>	Granite Spiny Lizard

Family Leptotyphlopidae

L <i>Leptotyphlops humilis humilis</i>	Western Blind Snake
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Family Lguanidae

L <i>Phrynosoma coronatum blainvillii</i>	Coast Horned Lizard
P <i>Sceloporus graciosus vandenburgianus</i>	Sagebrush Lizard
L <i>Uta stansburiana</i>	Side-blotched Lizard

Family Scincidae

L <i>Eumeces gilberti rubricaudatus</i>	Gilbert Skink
L <i>Eumeces skiltonianus interparietalus</i>	Western Skink

Family Teiddae

L <i>Cnemidophorus hyperythrus beldingi</i>	Orange-throated Whiptail
L <i>Cnemidophorus tigris multiscutatus</i>	Western Whiptail

Family Viperidae

L <i>Crotalus mitchellii pyrrhus</i>	SW Speckled Rattlesnake
L <i>Crotalus ruber ruber</i>	Red Diamond Rattlesnake
C <i>Crotalus viridis helleri</i>	Southern pacific Rattlesnake

Family Xantusiidae

P <i>Xantusia henshawi henshawi</i>	Granite Night Lizard
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Order Urodela

Family Plethodontidae

P <i>Aneides lugubris</i>	Arboreal Salamander
L <i>Batrachoseps pacificus major</i>	Pacific Slender Salamander
L <i>Ensatina escholtzii escholtzii</i>	Monterey Salamander
L <i>Ensatina escholtzii klauberi</i>	large-blotched Salamander

Family Salamandridae

P <i>Taricha torosa torosa</i>	California newt
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L -(Likely) Verified by collections in the San Diego Natural History Museum collection catalogs to exist in the Palomar Mountain area. Most records are from Ben Banta's pitfall trap survey of Nate harrison Grade, Mt. Palomar between 1970-1972.

P -(Possible) Range overlaps Research Natural Area, but there are no verified collection data from SDNHM.

Likely and possible in no way impile their abundance.

@ -*Hyla cadaverina* is not found sympatric with *H. regilla*.

* -Partially to totally aquatic

APPENDIX VII

List of Likely Mammals

Mammals Likely in the Eagle Cragg RNA

Order

Family Ruminantia

Odocoileus hemionus Mule Deer O

Order Carnivora

Family Canidae

Canis latrans Coyote O

Urocyon cinereoargenteus Grey Fox O

Family Felidae

Felis concolor Cougar O

Lynx rufus Bobcat

Family Mustelidae

Mephitis mephitis Striped Skunk O

Family Procyonidae

Bassaricus astutus Ringtail

Procyon lotor Raccoon

Order

Family Soricidae

Sorex ornatus Ornate Shrew

Order

Family Leporidae

Sylvilagus bachmani Brush Rabbit

Order Rodentia

Family Cricetidae

Neotoma fuscipes Woodrat

Peromyscus boylii Brush Mouse

Peromyscus californicus California Mouse

O- Observed

Peromyscus maniculatus
Reithrodontomys megalotis

Deer Mouse
Western Harvest Mouse

Family Heteromyidae

Dipodomys sp.
Perognathus longimembris

Kangaroo Rat
Pocket Mouse

Family Sciuridae

Eutamias merriami
Glaucomys sabrinus
Sciurus griseus

Merriam Chipmunk
Northern Flying Squirrel
Gray Squirrel

O

O- Observed

APPENDIX VIII

Diagram 1. Aprroximate locations where photographs were taken from.

Figure 1. View northwest toward Eagle Crag.

Figure 2. *Monardella macrantha* Gray ssp. *hallii* Abrams in flower.

Figure 3. *Linanthus ocuttii* (Parry & Gray) Jeps. in flower.

Figure 4. *Sedum spathulifolium* ssp. *yosemitense* in flower.

Figure 5. View northeast toward Cutca valley from Cutca Trail, showing some of the chaparral patch and southern BCDF patch.

Figure 6. View to the east from the same location as Figure 5.

Figure 7. View east over the larger BCDF patch.

Figure 8. View toward Palomar Magee Trail from same spot as figure 7.

Figure 9. View south from same point as figs. 7 & 8 showing boundary between canyon live oak forest and BCDF patch above Palomar Magee Trail.

Eagle Crag Research Natural Area

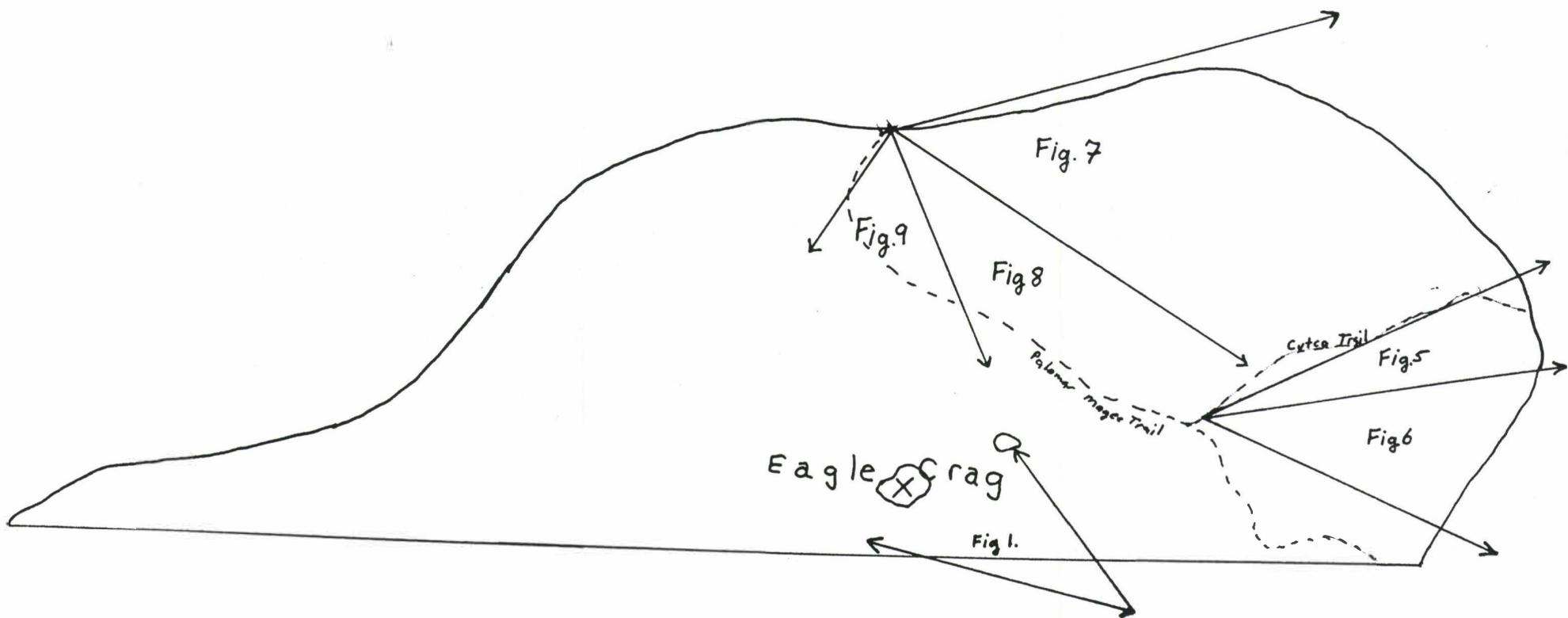


Diagram 1. Locations where photographs were taken for figures 1,5-9.



Figure 1. View northwest toward Eagle Crag.



Figure 2. *Monardella macrantha* Gray ssp. *hallii* Abrams in flower.



Figure 3. *Linanthus ocuttii* (Parry & Gray) Jeps. in flower.



Figure 4. *Sedum spathulifolium* ssp. *yosemitense* in flower.



Figure 5. View northeast toward Cutca valley from Cutca Trail,
showing some of the chaparral patch and southern BCDF
patch.



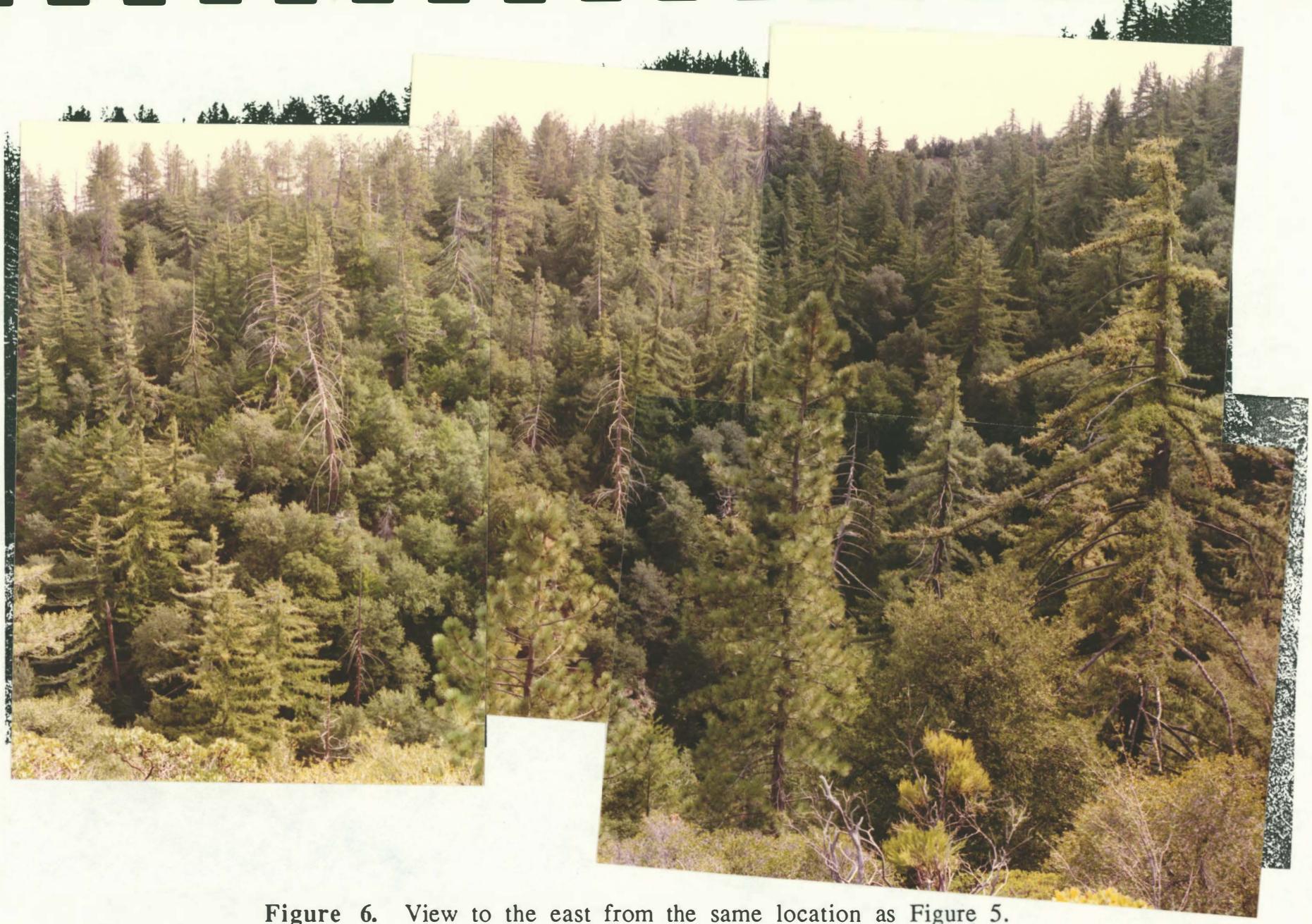


Figure 6. View to the east from the same location as Figure 5.



Figure 7. View east over the larger BCDF patch.

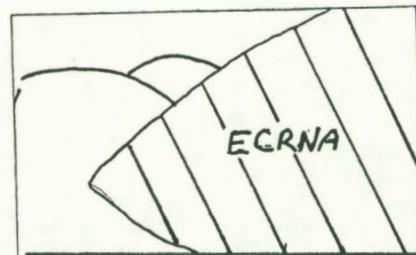




Figure 8. View toward Palomar Magee Trail from same spot as figure 7.



Figure 9. View south from same point as figs. 7 & 8 showing boundary between canyon live oak forest (right) and BCDF patch (left). Chaparral in foreground is outside the ECRNA.

Addition to the section "Rare Plants, Range Extensions and Species of Interest"

Monardella macrantha Gray ssp. *halli* Abrams Lamiaceae

This subspecies is listed by the CNPS as rare, threatened or endangered throughout its range. The potential for extinction is low at this time. The subspecies is endemic to California.

Munz (1974) lists the distribution of ssp. *halli* as including the San Gabriel, San Bernadino, Cuyamaca and Santa Ana Mts. The type specimen is from Palomar Mt. (Abrams, 1912) and in the San Diego Natural History Museum all specimens from the Palomar area are assigned to ssp. *halli*. In the ECRNA, all monardella were observed to have scarlet corollas, not yellow as described by Munz (1974) and Beachamp (1986). On the other hand, the corolla color was not mentioned in the original description which distinguished ssp. *halli* from ssp. *macrantha*.

Monardella macrantha ssp. *halli*, should, therefore, be added to the ECRNA flora and *Monardella macrantha* ssp. *macrantha* removed. Hall's Monardella is common in open areas of the BCDF understory, throughout the ECRNA.

Reference: Abrams, L. R. 1912. The Monardellas of Southern California-I. *Muhlenbergia*. 8: 27-36.

Bromus orcuttianus Vasey var. *halli* Hitch. in Jeps. Poaceae

This species is not listed as rare, threatened or endangered in California or elsewhere. Beachamp (1986), however, lists it as scarce in San Diego County and gives its known localities as Palomar

Mountain and Banner Grade. Munz (1974) lists it as occurring from Riverside County north. Thus, it may be presumed that this species has interest as another species which is near its southernmost range extension.

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